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TRUE DEFINITION OF COSMIC RED SHIFT AND A REVIEW ON COSMIC EXPANSION BASED ON MICROSCOPIC PHYSICAL CONSTANTS AND TRUE RED SHIFT

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Abstract

Considering our recently proposed light speed expanding Hubble-Hawking Universe and considering the recent paper pertaining to cosmic halt authored by Cosmin Andrei, Anna Ijjas, and Paul J. Steinhardt and reviewed by Saul Perlmutter, in this paper we propose a very simple model of universe having early stage light speed expansion and current stage quantum halt accompanied by light speed rotation. Representing early cosmic expansion and rotation as an outward spiral, Hubble's law can be considered as a representation of current cosmic rotation having no further expansion. Proceeding further, we would like to emphasize the point that, traditional definition of cosmic red shift is absolutely wrong. Based on photon energy, true cosmic red shift must be defined as the ratio of change in wavelength to the observed wavelength of photon. Halting state of the current universe can be understood with a combined study of the gravitational potential energy of proton and electron separated by a distance of 0.84 fermi and half the product of reduced Planck's constant and current Hubble parameter.

Keywords: Planck ball; Quantum cosmology; Hubble-Hawking universe; Light speed expansion; Light speed rotation; Cosmic halt with quantum physics;

1. Introduction

It is very surprising to note that, after 20 years of a strong footing, based on 'quintessence' driven universe, within coming 100 million years, universe is coming to a halt and slowly getting contraction to form a big crunch [1]. This technical paper has been reviewed by one of the co-founders of the accelerating universe, Saul Perlmutter [2] and got published in the Proceedings of the National Academy of Sciences of USA in April 2022. It is certain that this paper will bring a radical change among mainstream cosmologists and engineers. As per the papers published in Astronomical Journal 2012 [3] and Nature-Scientific Reports 2016 [4], data pertaining to 580 to 740 super novae clearly reveal that, universe is expanding at an uniform rate. In 2018-2019, the same result has been obtained by a student Lisa Goh Wan Khee of National University of Singapore supervised by Cindy Ng [5]. This information can be considered as a base for current non-accelerating universe.

Mainstream cosmologists are strongly believing that, current expanding universe is having no center and no rotation [6]. Scientists who are strongly believing in cosmic rotation suggest that, current magnitude of cosmic angular velocity is very small in magnitude and is beyond the scope of observations [7,8,9]. Unfortunately, applications of cosmic angular velocity are also lagging in acquiring a strong foundation in constructing workable models of rotating cosmologies. In this context, we emphasize the following facts.

1) Quantum cosmology [10] point of view, in a theoretical approach, Spin or Rotation can be given a chance in developing quantum models of cosmology.
2) Current model of Lambda cosmology [11] is badly failing in incorporating quantum gravity concepts.
3) Very few cosmologists are working on quantum cosmology models.
4) Clearly speaking, no cosmologist is having a clear vision of quantum models of cosmology.

Keeping these points in view, we can confidently say that, models of cosmology without cosmic rotation cannot be considered as standard models

of cosmology. In support of this statement, we propose the following logical points.

1) Important point to be noted is that, to have rotation, universe should have a closed or positive curvature. Three most recent technical papers [12,13,14] published in three very high impact journals seem to support a closed universe. In this context, we would like to recall the views of Di Valentino, Melchiorri and Silk [12]. According their analysis and interpretation, observed enhanced lensing amplitude of cosmic microwave background radiation can be explained with a positive curvature of the universe at 99% confidence level. According to George Ellis and Julien Larena [13], the possibility that the universe might be positively curved, although it would not solve all the existing tensions at once, opens exciting theoretical possibilities for cosmology. Proceeding further, according to Will Handley [14] - In light of the inconsistency between Planck, CMB lensing and BAO data in the context of curved universes, cosmologists can no longer conclude that observations support a flat universe.
2) Hubble's observations [15] can also be studied with rotating and expanding models of cosmology. In a rotating frame, quantitatively Hubble's law resembles cosmic light speed rotation concept.
3) General theory of relativity is no way against to cosmic rotation [16]. In a non-accelerating universe, considering red shift as a measure of galactic distances and revolving speeds, references [3,4,5] can be considered as a supporting data for a rotating universe.
4) Without a radial in-flow of matter in all directions towards one specific point, one cannot expect a big crunch and without a big crunch, one cannot expect a big bang. Really if there was a "big bang" in the past, with reference to formation of big bang as predicted by GTR and with reference to the cosmic rate of expansion that might have taken place simultaneously in all directions at a "naturally selected rate" about the point of big bang: "point" of big bang can be considered as the characteristic reference point of cosmic expansion in all directions. Thinking in this way, either the point of big bang or baby Planck ball can be considered as a possible centre of cosmic evolution.

5) If observed universe is assumed to be associated with only one big bang, then 'point of big bang' can certainly be considered as the characteristic reference point of cosmic evolution in all directions.
6) If currently believed cosmic big bang is really a 'singularity', it seems more logical to depend on Planck scale rather than big bang. It may be noted that, in general, gravitational singularities are not clear about "Where, When and How" like essential points that are believed to be the basics of developing any workable physical model.
7) No model of cosmology is clear about the origin of cosmic thermal radiation. Even though big bang model is giving lot of information on cosmic thermal evolution, origin point of view, initial conditions are beyond the scope of big bang.
8) Both, Planck scale and big bang are being implemented simultaneously in understanding cosmic initial conditions leading to an ambiguous situation on whether to consider only big bang or only Planck scale.
9) Modern cosmological observations are providing strong evidences for the existence of mysterious rotational features of large cosmic filaments [17].
10) Current Hubble's constant can be considered as a limiting magnitude of current cosmic angular velocity. Similarly, light speed can be considered as a limiting magnitude of current cosmic rotation speed.
11) Current Hubble mass can be considered as a characteristic mass limit of current universe having a closed curvature.
12) So far, on large scale distances, physically,
    a) No galaxy is confirmed to have super-luminal speeds.
    b) No verification for actual galactic receding speeds.

2. Hubble-Hawking cosmology

Based on light speed expansion, modified red shift formula, scaled Hawking's black hole temperature formula, super gravity of galactic baryon matter and baby Planck ball – in our recent publications, we have clearly established a novel model of quantum cosmology [18-28]. This paper is a modified version of our recent paper [28] and the key change is that, we consider current cosmic halt and light speed rotation in place of assumed

current light speed expansion. Here we would like to appeal that, a new model of cosmology, that follows Hubble's notion of expansion and Hawking's notion of black hole structure having thermal radiation can be called as Hubble–Hawking model of cosmology. We continue this section with the need of considering light speed expansion and rotation.

2.1 Need of considering light speed expansion and rotation

Technical publications that are having very high impact on science community are raising many new ideas and doubts on dark energy and dark matter. Now it is very clear hat, there is a disagreement between main stream cosmologists and other researchers. Cosmological observations are not straight forward. For the same data, different interpretations are coming into picture with a great diversity. Right now it is not at all possible to prove the exact nature of cosmic expansion whether it is accelerating or decelerating. In this very ambiguous situation, it seems interesting to take the help of 'light speed' as a tool. There is a possibility for considering light speed radial expansion as well as light speed rotation. We would like to emphasize that,

1) All cosmological observations and physical studies & research are being accomplished with 'light speed' only.
2) So far no single experiment or no single observation confirmed super luminal physical results.
3) It is well confirmed that, gravitons are also moving with speed of light.
4) In one sentence, 'without light', there is no cosmology and there is no physics.

2.2 Present cosmic critical density, volume and mass

Currently believed cosmic critical density is, $\rho_0 \cong \left(3H_0^2/8\pi G\right)$. Considering the product of currently believed cosmic critical density and Hubble volume, $V_0 \cong \left(\frac{4\pi}{3}\right)\left(c/H_0\right)^3$, it is possible to show that, $M_0 \cong \left(c^3/2GH_0\right)$. On re-arranging this mass expression, $2GM_0/c^2 \cong c/H_0 \cong R_0$. It clearly indicates something new about the current universe in terms of current cosmic black hole mass, radius and expansion speed or rotation speed. We interpret this relation as, at present, $R_0 \cong \left(c/H_0\right) \cong 2GM_0/c^2$.

2.3 Present cosmic temperature

Currently believed cosmic temperature T_0 seems to be equal to the geometric mean of Hawking temperature [29] of Planck mass, $T_{M_{pl}} \cong \frac{\hbar c^3}{8\pi k_B G M_{pl}}$ and Hawking temperature of current cosmic Hubble mass, $T_{M_0} \cong \frac{\hbar c^3}{8\pi k_B G M_0}$. In a simplified form, it can be expressed as, $T_0 \cong \frac{\hbar c^3}{8\pi k_B G \sqrt{M_{pl} M_0}}$. It clearly indicates something new about the current cosmic temperature in terms of Hawking's Black hole physics. We interpret this relation as, with respect to Planck scale, $T_0 \cong \frac{\hbar c^3}{8\pi k_B G \sqrt{M_{pl} M_0}} \cong \frac{\hbar \sqrt{H_0 H_{pl}}}{4\pi k_B}$ where $M_0 \cong \frac{c^3}{2GH_0}$, $M_{pl} \cong \sqrt{\frac{\hbar c}{G}}$ and $H_{pl} \cong \frac{1}{2}\sqrt{\frac{c^5}{G\hbar}}$.

For an observed value of $T_0 \cong 2.72548\ \text{K}$, estimated $H_0 \cong 2.167867 \times 10^{-18}\ \text{sec}^{-1} \cong 66.89\ \text{km/sec/Mpc}$. We would like to emphasize the point that, based on Hawking's black hole temperature formula, geometric mean of Planck mass and the so called Hubble mass, seems to play a crucial role in estimating the observed cosmic microwave back ground temperature, (CMBR) [30]. This kind of relation is missing in Lambda cosmology and to a great extent, currently observed discrepancy or tension in estimating the Hubble parameter can be eliminated. Proceeding further currently believed Baryon acoustic bubble radius [31] can be fitted with a simple relation of the form, $(R_{BAO})_0 \cong \sqrt{\frac{T_0}{T_{\text{Recombination}}}} * \left(\frac{c}{H_0}\right) \cong \sqrt{\frac{2.725\ \text{K}}{3000\ \text{K}}} * \left(\frac{c}{H_0}\right) \cong \frac{c}{H_{\text{Recomb}}^{1/4} H_0^{3/4}} \cong 135\ \text{Mpc}.$

Considering both Planck mass and the Universe as 'point particles', cosmic temperature relation can be derived with three hypothetical conditions, $\frac{GM_0 M_{pl}}{r_0^2} \cong \left(\frac{c^4}{8\pi G}\right)$; $r_0 \cong \left(\frac{2.898\times 10^{-3}}{2\pi T_0}\right)$ and $M_0 \cong \left(\frac{c^3}{2GH_0}\right)$. Derived relation is, $T_0 \cong \frac{\hbar c^3}{24.891 k_B G\sqrt{M_{pl}M_0}}$ and the denominator coefficient 24.891 is close to $8\pi \cong 25.13274$.

2.4 Present galactic light travel distances

It may be noted that, by the time of defining the definition of galactic red shift, maximum red shift value was around 0.003. In this context, in terms of energy of photon, we would like to emphasize the point that, traditional definition of cosmic red shift is absolutely wrong. True cosmic red shift must be defined as - ratio of loss in energy of photon to the energy of photon at galaxy or lab. As a consequence, in terms of wavelength of photon, red shift can be defined as, the ratio of change in wavelength to the observed wavelength of photon. In a mathematical form, $z_{new} \cong \frac{E_{Lab} - E_{Observed}}{E_{Lab}} \cong \frac{\lambda_{Observed} - \lambda_{Lab}}{\lambda_{Observed}} \cong 1 - \frac{\lambda_{Lab}}{\lambda_{Observed}} \cong \frac{z}{z+1}$. With reference to current definition, $0 > z < \text{Infinity}$. By following our new definition, $0 > z_{new} < 1$. It may be noted that, with our given definition, it is very easy to implement 'light speed rotation' in cosmic evolution scheme. Fig. 1 compares galactic light travel distances according to our new definition, $d_G \cong (z_{new})(c/H_0)$ (Red curve) and the conventional formula connected with dark energy density and other density fractions (Green curve). For verification, readers are encouraged to visit the URLs, http://www.atlasoftheuniverse.com/cosmodis.c and https://cosmocalc.icrar.org/. Richard Powell has written an online C program (http://www.atlasoftheuniverse.com/cosmodis.c) (version 1.1) for estimating the light travel distance [32]. See Appendix A for the C++ program. Using that program and considering a redshift of $z = (0.1 \text{ to } 200)$, we have prepared Figure 1. Green curve indicates the light travel distance in Lambda cosmology prepared with Omega matter = 0.32, Omega lambda = 0.68, Omega radiation = 0.0 and $H_0 = 66.87$ km/sec/Mpc. Figure 1 will certainly encourage any cosmologist to solve Einstein's field equations with a closed curvature spreading at speed of light and rotating at speed of light. As traditional redshift is increasing from 0, error in estimated light travel distance is increasing to

+8.59% at $z \cong 1.20$ and from there onwards, error is reaching to 0% at $z \cong 11.5$ to 11.55. Proceeding further, error is reaching to -5.14% at $z \cong 200.0$. By considering $z_{new}c$ as the revolving speed of galaxy (about cosmic axis if it exists), Hubble's lav [15] can be expressed as, $v_G \cong H_0 d_G$.

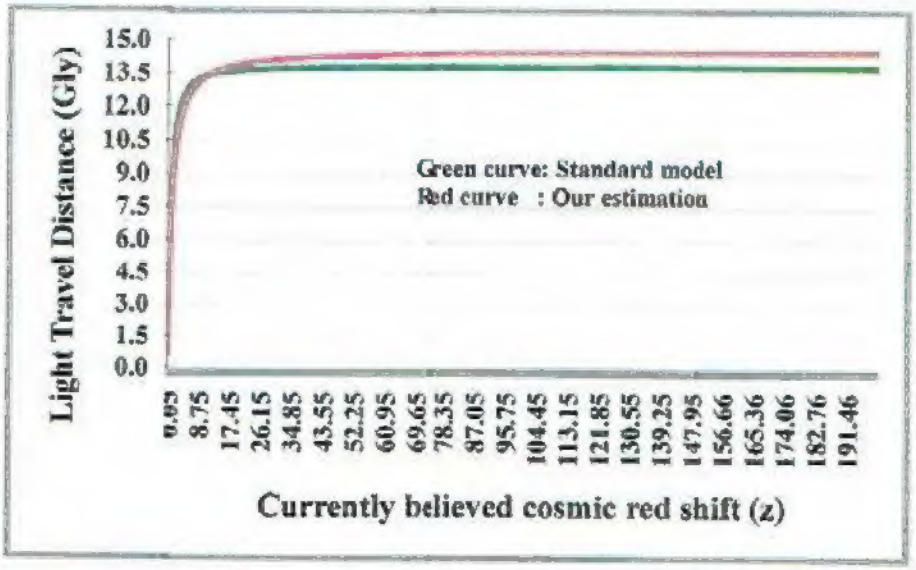

Figure 1. Comparison of standard and estimated light travel distances

3. Our 6 basic assumptions pertaining to cosmic structure and galactic structure

Based on the above points and logics proposed in sections (1) and (2),

1) We emphasize the point that, without a radial in-flow of matter in all directions towards any one specific point, it may not be possible to have a big crunch and discussing on center-less universe having a big bang or big bounce seems to be meaningless.
2) Considering the evolving universe as a growing black hole or simply a white hole [20,21], it seems natural to expect cosmic rotation.

In this section, considering the current Hubble's constant as an index of current cosmic angular velocity, we propose a simple model of light speed expanding and light speed rotating model of cosmology. It needs a review at fundamental level. Out of 6 assumptions, first four assumptions are associated with cosmic structure and expansion and the last two assumptions are associated with dark matter and galactic structure.

Assumption-1: At present, cosmic angular velocity is equal to the present Hubble constant. Mathematically, at present,

$$\begin{aligned} &\omega_0 \cong H_0 ----(1\text{A})..\text{Fitting with current data.} \\ &\omega_t \cong H_t ----(1\text{B})..\text{To be confirmed with further study for } (z+1) > 1100. \end{aligned} \quad (1)$$

Assumption-2: Universe is expanding like a black hole with initial light speed expansion and rotation and finally halted with light speed rotation. Mathematically, at present,

$$R_0 \cong \frac{2GM_0}{c^2} \cong \frac{c}{\omega_0} \quad (2)$$

Assumption-3: Universe is expanding like a black hole with a scaled Hawking's black hole temperature formula. Mathematically, it can be expressed as,

$$T_0 \cong \frac{\hbar c^3}{8\pi k_B G\sqrt{M_{pl}M_0}} \cong \frac{\hbar\sqrt{\omega_0\omega_{pl}}}{4\pi k_B} \quad (3)$$

$$\text{where } M_0 \cong \frac{c^3}{2G\omega_0},\ M_{pl} \cong \sqrt{\frac{\hbar c}{G}} \text{ and } \omega_{pl} \cong \frac{1}{2}\sqrt{\frac{c^5}{G\hbar}}.$$

It may be noted that, this assumption certainly helps in eliminating the tension in estimating the magnitude of Hubble parameter.

Assumption-4: Following light speed rotation, at present cosmic expansion is coming to a halt. Considering proton and electron rest masses, in a quantum mechanical approach it can be understood as,

$$\frac{Gm_p m_e}{R_p \omega_0} \cong \frac{\hbar}{2} \tag{4}$$

where $R_p \cong (0.84184 \text{ to } 0.87680)$ fm is the root mean square radius of proton [33].

Assumption-5: There exists no dark matter [34-38] and when baryon mass of any galaxy crosses (180 to 200) million solar masses, galaxy 'as a whole' experiences super gravity [22,26] in such a way that its effective or total mass can be expressed as,

$$\begin{aligned}(M_{Total})_G &\cong \left\{(M_{baryon})_G + \left[\frac{(M_{baryon})_G^{3/2}}{\sqrt{(M_{\text{limit}})_0}}\right]\right\} \text{....(without dark matter)} \\ &\cong \left\{(M_{baryon})_G + (M_{dark})_G\right\} \text{......(if there exists dark matter)}\end{aligned} \tag{5}$$

$$\text{where}, \begin{cases} (M_{\text{limit}})_0 \cong \text{Current mass limit of ordinary gravity} \\ \qquad \cong 180 \text{ to } 200 \text{ solar masses} \cong (3.6 \text{ to } 4.0)\times 10^{38} \text{ kg.} \\ (M_{baryon})_G = \text{Galactic baryon mass.} \\ (M_{dark})_G = \text{Galactic dark mass.} \\ (M_{Total})_G = \text{Total mass of Galaxy.} \end{cases}$$

Starting from the recombination period, for $(M_{\text{limit}})_0$, its current cosmological mass expression can be expressed as,

$$\frac{M_0}{(M_{\text{limit}})_0} \cong \exp\left(\sqrt{\frac{T_{\text{Recomb}}}{T_0}}\right)$$

$$\text{where } M_0 \cong \frac{c^3}{2G\omega_0} \text{ and } \frac{T_{\text{Recomb}}}{T_0} \cong \frac{\text{Recombination temperature}}{\text{Current cosmic temperature}} \cong \frac{3000 \text{ K}}{2.725 \text{ K}}.$$

Assumption-6: Current cosmic mass plays a vital role in understanding the observed galactic flat rotation speeds in such a way that,

$$\frac{V_G}{c} \cong \frac{1}{4}\left[\frac{(M_{Total})_G}{M_0}\right]^{1/4} \tag{6}$$

$$V_G \cong 0.2973\left[G(M_{Total})_G(ca_0)\right]^{1/4} \tag{7}$$

It may be noted that, this relation is very similar to the famous MOND's formula [33]. Interesting point to be noted is that (ca_0) can be considered as the upper limit of current cosmic acceleration. In addition to that, MOND's concept of weak gravity can be studied in terms of Mach's view on the universal role of cosmic distance back ground [39]. See Fig. 2 for the estimated galactic flat rotation speeds.

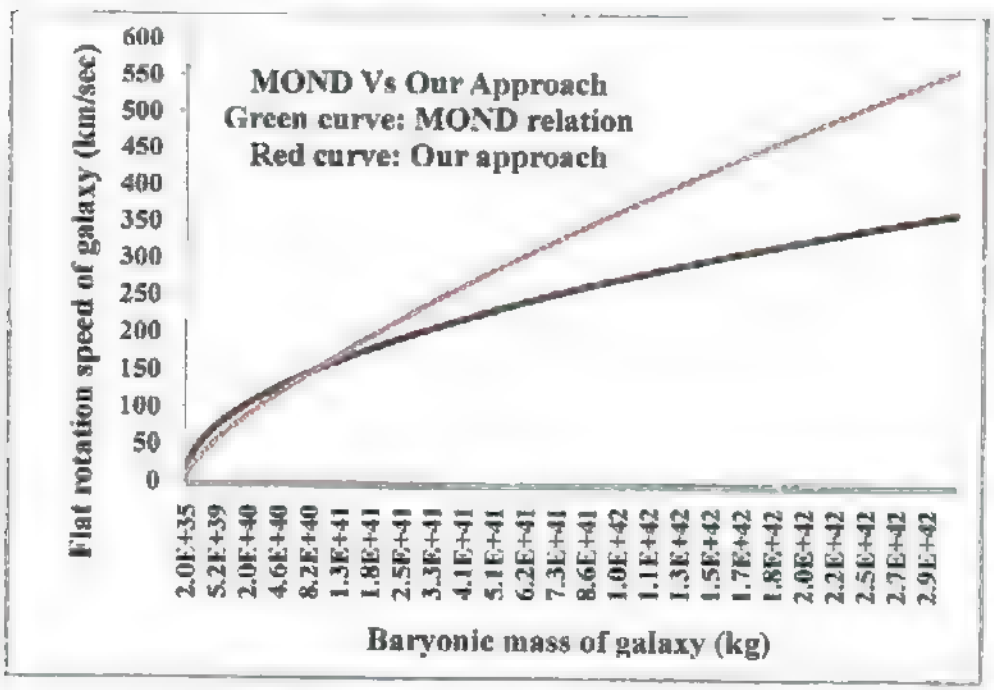

Figure 2: Galactic flat rotation speeds

Flat rotation speeds from 10 km/sec to 500km/sec can be understood in this way. Our proposal is in line with newly discovered dark matter deficient galaxies [40] and large massive galaxies having high flat rotation speeds [41]. Another interesting feature is that, Sun's estimated equivalent dark mass is

around 1.5×10^{26} kg and its effect seems to be negligible. It needs observational and experimental confirmation. To some extent, considering the estimated Virial mass of Sun and based on the theory of light bending, our proposal can be confirmed. Nucleons estimated equivalent dark mass is around 10^{-60} kg and it needs experimental verification.

4. Discussion on present cosmic rotation

Historically, Godel, Gamow, Whittakar, Hawking, Narlikar, Nodland, Ralston, Rubin, Birch, Korotky, Obukhov, Chechin, Sivaram, Magueijo and Longo like many cosmologists expressed their positive opinion on cosmic rotation [7-9],[42-47]. Recent observations on cosmic anisotropy [48] and galactic spin directions seem to support the possible existence of cosmic rotation [49]. Most recent references [12,13,14] seem to shed light on the necessity of considering cosmic positive curvature which is a major prerequisite for cosmic rotation. Even though cosmological principle [50,51] is having 100 years of strong footing, at present, it is being suspected and examined in many directions seriously. It may also be noted that, the argument that the Universe does not rotate is not based on observational evidence, but is merely an assumption that became popular.

It may be noted that, by considering 'light speed rotation' and ignoring 'light speed expansion', Einstein's static universe can be made stable dynamically. There seems no need to introduce the 'Lambda term'. Against to the strongly believed current cosmic acceleration [2], if current universe is having a trend of deceleration as proposed by Paul J. Steinhardt et al and reviewed by Perlmutter S. [1] – by considering light speed rotation throughout the cosmic history- there is a scope for developing light speed rotating and decelerating models of cosmology [18]. We are working on understanding and validating the dual role of light speed in cosmic expansion and rotation. With ongoing observations, whether it is cosmic light speed expansion or light speed rotation - can be explored in all possible ways.

5. Discussion on present cosmic halt

Based on ref. [1], it seems very clear to say that, dark energy is taking a new turn and making the universe to decelerate and within 100 million years, universe is coming to a halt. Here it is very important to note that, so far no

single observation or no single experiment has shown a signal for the existence of dark energy. Cosmologists are somehow making attempts to understand the expanding nature of current universe in terms of dark energy for acceleration as well as deceleration. If it is really true that, in near future, universe is going to a halt, based on assumptions (1) to (4), it can be understood in terms of unification of atomic and cosmic physical constants [52-56]. Relation (4) can be re-written as,

$$\begin{aligned} &\frac{Gm_p m_e}{R_p} \cong \frac{1}{2}\hbar\omega_0 \quad ---(8A) \\ &\frac{2Gm_p m_e}{\hbar R_p} \cong \omega_0 \cong (67.88 \text{ to } 70.69)\text{km/sec/Mpc}---(8B) \\ &\text{where } R_p \cong (0.84184 \text{ to } 0.87680) \text{ fm} \end{aligned} \quad (8)$$

Here in this expression, LHS is a representation of gravitational potential energy of proton and electron separated by a distance equal to the root mean square radius of proton. RHS seems to be a representation of ground state quantum of energy associated with cosmic angular velocity and characteristic quantum constant.

Following relation (4), quantum of orbiting electron's areal velocity can be expressed as,

$$\frac{dA}{dt} \cong \frac{1}{2}vr \cong \frac{Gm_p}{R_p\omega_0} \quad (9)$$

Based on our 4G model of unification [57-60], we noticed that [61],

$$R_p \simeq \sqrt{\frac{\alpha_s}{\alpha}}\left(\frac{\hbar}{m_p c}\right) \cong \sqrt{\frac{0.115 \text{ to } 0.12}{0.0073}}\left(\frac{\hbar}{m_p c}\right) \cong (4 \mp 0.05)\left(\frac{\hbar}{m_p c}\right) \cong 4\left(\frac{\hbar}{m_p c}\right) \quad (10)$$

where α_s is the strong coupling constant and α is the fine structure ratio. Hence, it is also possible to write another two relations in the following way.

$$\left.\begin{aligned}&\sqrt{\frac{Gm_p^2 m_e c}{2\omega_0}} \cong \hbar \text{---}(11A)\\&\frac{Gm_p^2 m_e c}{2\hbar^2} \cong \omega_0 \cong 70.75 \text{ km/sec/Mpc}\text{---}(11B)\end{aligned}\right\} \tag{11}$$

Another very interesting relation is associated with fine structure ratio. For $\omega_0 \cong H_0 \cong 76.266$ km/sec/Mpc,

$$\frac{1}{\alpha} \cong \ln\sqrt{\frac{(E_T)_0/2}{(E_{em})_0}} \cong \ln\sqrt{\frac{4\pi\varepsilon_0 c^6}{23040\pi G\omega_0^2 e^2}} \cong 137.036 \tag{12}$$

where

$(E_T)_0 \cong aT_0^4\left(\frac{4\pi}{3}\left(\frac{c}{\omega_0}\right)^3\right) \cong$ Current thermal energy within the current Hubble volume.

$(E_T)_0/2 \cong$ Half of $aT_0^4\left(\frac{4\pi}{3}\left(\frac{c}{\omega_0}\right)^3\right)$

$\cong$ Current thermal energy within the current hemi spherical or dipole Hubble volume.

$(E_{em})_0 \cong \frac{e^2}{4\pi\varepsilon_0 (c/\omega_0)} \cong$ Electromagnetic potential assocaited with current Hubble radius.

Readers are encouraged to refer the URL for various values of the current Hubble parameter estimated with various methods: https://en.wikipedia.org/wiki/Hubble%27s_law. From the data it is clear that, $H_0 \cong$ (67.6 to 76.2) km/sec/Mpc. Relation (12) seems to give a nice picture of the current cosmic closed or positive curvature and it needs a very special study at fundamental level.

6. General discussion on quantum cosmology

Quantum cosmology point of view, our assumptions are very clear and seem to incorporate Planck scale in current cosmic observations. Our assumptions (1) to (4) are giving a very nice explanation for the origin of current cosmic temperature and its observed isotropy on large scales. Proceeding further,

halting of the universe with atomic, nuclear and quantum physical constants seem to open a new branch of cosmology associated with microscopic physics. We are working on finding other such relations. It is well believed that, Hawking's findings about black holes and the universe [62] are the most important contributions to physics in recent decades. Proposed Hawking's scaled black hole temperature formula can be given a chance in understanding and refining the views of Hawking's multi universal paradigm.

1. General discussion on Hubble's law in view of cosmic rotation

Following section (2.4), if one is willing to consider cosmic red shift definition as,

$$z_{new} \cong \frac{\lambda_{Observed} - \lambda_{Lab}}{\lambda_{Observed}} \cong 1 - \frac{\lambda_{Lab}}{\lambda_{Observed}} \cong \frac{z}{z+1} \tag{13}$$

It will certainly help in understanding and resolving the issues connected with cosmic acceleration and dark energy. Based on this new definition of cosmic red shift, observed farthest galaxies distance can be estimated very easily. For example, see the following Table 1. We sincerely appeal that, on cosmological scales, 2.5% is not yet all a 'serious' error. We would like to emphasize the point that, conceptually, we are no way deviating from the basic idea of cosmic expansion. Only thing is that, we are confining to 'initial light speed expansion and rotation' and 'present light speed rotation with no further expansion'. Whether current/future universe is expanding or not can be understood with,

a) Rate of decrease in cosmic temperature.
b) Rate of decrease in Hubble parameter.

Based on the data presented in Tab. 1 Hubble's law for cosmic rotation applicable to whole Hubble volume can be expressed as,

$$d_{G}\omega_0 \cong \left(\frac{z}{z+1}\right)c \cong \left(z_{new}\right)c \tag{14}$$

Cosmic scale factor seems to be associated with time and temperature rather than red shift. Scale factor can be expressed as,

$$1+z \cong \sqrt{\exp(\gamma_0-\gamma_t)} \cong \frac{T_t}{T_0} \tag{15}$$

where $\gamma_0 \cong 1-\ln\left(\frac{\omega_{pl}}{\omega_0}\right)$ and $\gamma_t \cong 1+\ln\left(\frac{\omega_{pl}}{\omega_t}\right)$

$T_t, T_0 \cong$ Past and current cosmic temperatures.

Table-1: To estimate and fit the distances of farthest galaxies

Galaxy	Redshift	Standard Light travel distance (Gly)	Estimated Light travel distance (Gly)	%Error
GN-z11	11.09	13.39	13.41	-0.15
MACS1149-JD1	9.11	13.26	13.17	0.65
EGSY8p7	8.68	13.23	13.11	0.91
A2744 YD4	8.38	13.2	13.06	1.05
EGS-zs8-1	7.73	13.13	12.95	1.41
z7 GSD 3811	7.66	13.11	12.93	1.36
z8_GND_5296	7.51	13.1	12.9	1.51
SXDF-NB1006-2	7.215	13.17	12.84	2.5
GN 108036	7.213	13.07	12.84	2.5
BDF-3299	7.109	13.05	12.84	2.5
A1703 zD6	7.014	13.04	12.84	2.5
BDF-521	7.008	13.04	12.84	2.5
G2-1408	6.972	13.03	12.84	2.5
IOK-1	6.964	13.03	12.84	2.5

Following our approach, currently believed cosmic time scale up to $1+z=1100$ can be expressed as,

$$t\omega_t \cong \sqrt{1+z} \tag{16}$$

It is an accurate fit and needs a careful review for its strange matching. We are working in this direction. If so,

$$t \cong \left(\frac{1}{1+z}\right)^{\frac{3}{2}}\left(\frac{1}{H_0}\right) \cong \left(\frac{1}{1+z}\right)^{\frac{1}{2}}\left(\frac{1}{\omega_0}\right) \cong \frac{\sqrt{1+z}}{\omega_t} \cong \frac{\left[\exp(\gamma_0-\gamma_t)\right]^{\frac{1}{4}}}{\omega_t} \tag{17}$$

where $\omega_t \cong \left(\frac{1}{\omega_{pl}}\right)\left(\frac{4\pi k_B T_t}{h}\right)^2 \cong 2\sqrt{\frac{G\hbar}{c^5}}\left(\frac{4\pi k_B T_t}{h}\right)^2$.

Interesting observation to be noted is that,

$$\frac{\omega_t}{\omega_0} \cong \exp(\gamma_0 - \gamma_t) \cong (1+z)^2 \tag{18}$$

8. Estimation of distances associated with galactic flat rotation speeds

Following assumptions (5) and (6), we suggest the following points for further study and observation.

1) Galactic total mass can be considered as the sum of galactic baryonic mass and dark mass.
2) As galactic total mass increases, galactic flat rotation speed as well as the distance associated with flat rotation speed increases.
3) Galactic core radius seems to depend on galactic baryon mass, current cosmic Hubble mass and the ratio of galactic baryon mass to total mass.
4) Galactic flat rotation distance seems to depend on galactic total mass, current cosmic Hubble mass and the ratio of galactic baryon mass to total mass.

Based on these points, we noticed a very simple relation for galactic flat rotation distances. It can be expressed as,

$$\begin{aligned} r_f &\cong \frac{2G\sqrt{\left(M_{baryon}\right)_G M_0}}{c^2} \\ &\cong \sqrt{\left(\frac{2G\left(M_{baryon}\right)_G}{c^2}\right)\left(\frac{c}{\omega_0}\right)} \cong \sqrt{\frac{2G\left(M_{baryon}\right)_G}{c\omega_0}} \end{aligned} \tag{19}$$

$$\text{where} \begin{cases} r_f = \text{Distance from galactic center associated with flat rotation speed.} \\ M_0 \cong \dfrac{c^3}{2G\omega_0} = \text{Current cosmic Hubble mass.} \end{cases}$$

Galactic core radius can be expressed as.

$$r_c \cong \sqrt{\frac{M_0}{\left(M_{Total}\right)_G}}\left(\frac{2G\left(M_{baryon}\right)_G}{c^2}\right) \tag{20}$$

Based on relations (19) and (20),

$$\begin{aligned}\frac{r_f}{r_c} &\cong \frac{\text{Distance from galactic center associated with flat rotation speed}}{\text{Galactic core radius}} \\ &\cong \sqrt{\frac{\left(M_{Total}\right)_G}{\left(M_{baryon}\right)_G}} \cong \sqrt{1+\frac{\left(M_{dark}\right)_G}{\left(M_{baryon}\right)_G}}\end{aligned} \tag{21}$$

Interesting point to be noted is that, by knowing the galactic flat rotation speed and flat rotation distance, galactic baryon mass, galactic total mass and hence galactic dark mass can be estimated in a unified approach. This is for observational test. Galactic whole radius can be expressed as,

$$R_G \cong \frac{G\left(M_{Total}\right)_G}{V_G^2} \cong \left(\frac{16G\sqrt{\left(M_{Total}\right)_G M_0}}{c^2}\right) \cong \sqrt{\frac{128G\left(M_{Total}\right)_G}{c\omega_0}} \tag{22}$$

It may be noted that, based on relations (19) to (22), galactic masses, flat rotation speeds and corresponding distances can be studied in a unified approach. Estimated baryon and dark masses can be compared with existing methods. Advantage of our approach is that, current cosmic Hubble mass can be considered as a key tool in exploring the structural secrets of galaxies.

See Tab. 2 for galactic masses, flat rotation speeds and working radii. See Fig. 3 for estimated galactic flat rotation distances. Galactic rotation curves for $r \geq r_c$ can be approximated with the following relations. It needs a fine tuning based on the actual curve [63].

Table 2. Galactic masses, flat rotation speeds and working radii

Assumed baryon mass $M_\odot$	Estimated dark mass $M_\odot$	Estimated total mass $M_\odot$	Estimated flat rotation speed (km/sec)	Estimated core radius (kpc)	Estimated flat rotation distance (kpc)	Estimated whole radius (kpc)
5.03E+05	2.51E+04	5.28E+05	4.34	0.014	0.015	0.120
7.54E+05	4.62E+04	8.00E+05	4.82	0.017	0.018	0.148
1.13E+06	8.48E+04	1.22E+06	5.35	0.021	0.022	0.183
1.70E+06	1.56E+05	1.85E+06	5.95	0.026	0.027	0.225
2.55E+06	2.86E+05	2.83E+06	6.61	0.031	0.033	0.279
3.82E+06	5.26E+05	4.34E+06	7.36	0.038	0.040	0.345
5.73E+06	9.66E+05	6.69E+06	8.20	0.046	0.049	0.428
8.59E+06	1.78E+06	1.04E+07	9.15	0.055	0.061	0.533
1.29E+07	3.26E+06	1.61E+07	10.22	0.066	0.074	0.665
1.93E+07	5.99E+06	2.53E+07	11.43	0.079	0.091	0.833
2.90E+07	1.10E+07	4.00E+07	12.82	0.095	0.111	1.047
4.35E+07	2.02E+07	6.37E+07	14.40	0.113	0.136	1.321
6.52E+07	3.72E+07	1.02E+08	16.21	0.133	0.167	1.675
9.78E+07	6.83E+07	1.66E+08	18.30	0.157	0.204	2.134
1.47E+08	1.25E+08	2.72E+08	20.70	0.184	0.250	2.731
2.20E+08	2.30E+08	4.51E+08	23.48	0.214	0.307	3.514
3.30E+08	4.23E+08	7.53E+08	26.71	0.249	0.376	4.544
4.95E+08	7.77E+08	1.27E+09	30.45	0.287	0.460	5.906
7.43E+08	1.43E+09	2.17E+09	34.80	0.330	0.563	7.714
1.11E+09	2.62E+09	3.74E+09	39.86	0.377	0.690	10.122
1.67E+09	4.82E+09	6.49E+09	45.76	0.429	0.845	13.339
2.51E+09	8.86E+09	1.14E+10	52.63	0.486	1.035	17.647
3.76E+09	1.63E+10	2.00E+10	60.64	0.549	1.268	23.430
5.64E+09	2.99E+10	3.55E+10	69.98	0.619	1.553	31.205
8.46E+09	5.49E+10	6.34E+10	80.88	0.695	1.902	41.674
1.27E+10	1.01E+11	1.14E+11	93.57	0.779	2.329	55.789
1.90E+10	1.85E+11	2.04E+11	108.38	0.871	2.852	74.837
2.86E+10	3.40E+11	3.69E+11	125.63	0.972	3.493	100.564
4.28E+10	6.25E+11	6.68E+11	145.74	1.083	4.279	135.333
6.43E+10	1.15E+12	1.21E+12	169.17	1.206	5.240	182.348
9.64E+10	2.11E+12	2.21E+12	196.48	1.341	6.418	245.951
1.45E+11	3.88E+12	4.02E+12	228.28	1.490	7.860	332.024
2.17E+11	7.12E+12	7.34E+12	265.33	1.655	9.627	448.539
3.25E+11	1.31E+13	1.34E+13	308.48	1.836	11.790	606.300
4.88E+11	2.40E+13	2.45E+13	358.74	2.037	14.440	819.950
7.32E+11	4.42E+13	4.49E+13	417.27	2.258	17.685	1109.333
1.10E+12	8.11E+13	8.22E+13	485.43	2.503	21.660	1501.342
1.65E+12	1.49E+14	1.51E+14	564.80	2.773	26.528	2032.429
2.47E+12	2.74E+14	2.76E+14	657.21	3.072	32.490	2751.996

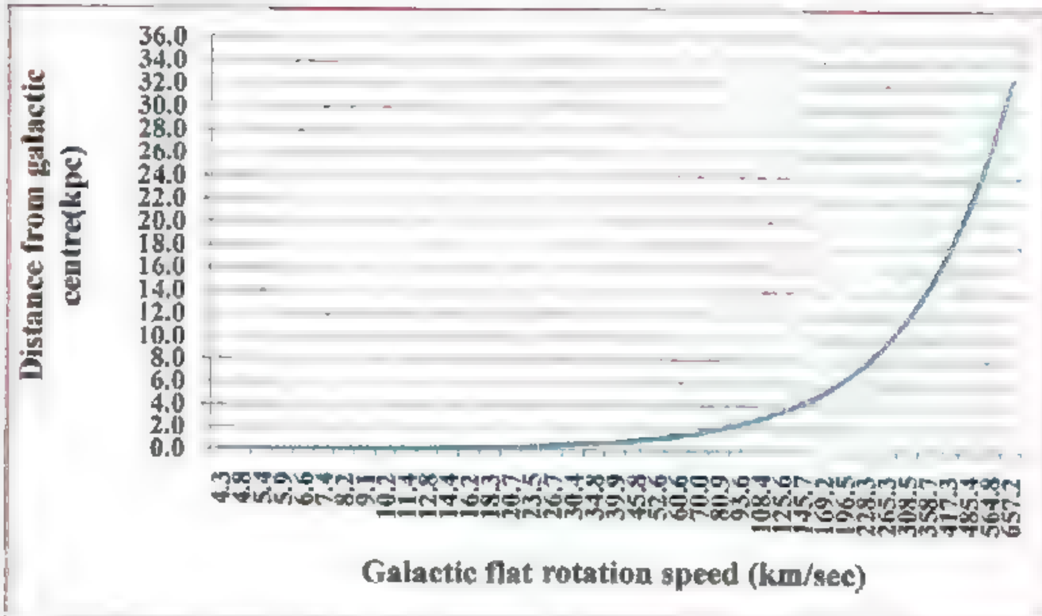

Figure 3: Galactic flat rotation speeds Vs distances

$$\left.\begin{aligned} V_r &\cong \frac{1}{3}\left[1+\ln\left(\frac{r}{r_c}\right)+\frac{1}{2}\ln\left(\frac{(M_{Total})_G}{(M_{baryon})_G}\right)\right]\left[\frac{G(M_{Total})_G V_{Ref}^2}{r}\right]^{\frac{1}{4}} \quad ---(23A) \\ V_r &\cong \frac{1}{3}\left[1+\ln\left(\frac{r}{r_c}\right)+\frac{1}{3}\ln\left(\frac{(M_{Total})_G}{M_{(M_{baryon})_0}}\right)\right]\left[\frac{G(M_{Total})_G V_{Ref}^2}{r}\right]^{\frac{1}{4}} \quad ---(23B) \end{aligned}\right\} \quad (23)$$

$$\text{where} \quad \left\{\begin{aligned} V_{Ref} &\cong \left[\frac{G(M_{Ref})_0\, c\omega_0}{128}\right]^{1/4} \cong 19.2 \text{ km/sec} \\ (M_{limit})_0 &\cong 4\times10^{38}\,\text{kg} \cong 200 \text{ million solar masses} \end{aligned}\right.$$

Thus, the proposed reference mass unit of 200 million solar masses seems to play a crucial role in deciding galactic structures.

See the following Fig. 4 pertaining to estimated Milky Way rotation Curves for 1.4 kpc to 319 kpc [64]. Estimated baryon mass, dark mass and total mass of Milky Way are, $1.2\times10^{11}M_\odot$, $2.94\times10^{12}M_\odot$ and $3.06\times10^{12}M_\odot$ respectively.

Based on relation (23), in terms of galactic core radius and flat rotation distance, galactic rotation curve can be re-expressed as,

$$\left.\begin{array}{l} V_r \cong \dfrac{1}{3}\left[1+\ln\left(\dfrac{r}{r_c}\right)+\ln\left(\dfrac{r_f}{r_c}\right)\right]\left[\dfrac{G\left(M_{Total}\right)_G V_{Ref}^2}{r}\right]^{\frac{1}{4}} \text{----}(24\text{A}) \\ V_r \cong \dfrac{1}{3}\left[1+\ln\left(\dfrac{r}{r_c}\right)+\dfrac{2}{3}\ln\left(\dfrac{r_f}{r_c}\right)\right]\left[\dfrac{G\left(M_{Total}\right)_G V_{Ref}^2}{r}\right]^{\frac{1}{4}} \text{---}(24\text{B}) \end{array}\right\} \quad (24)$$

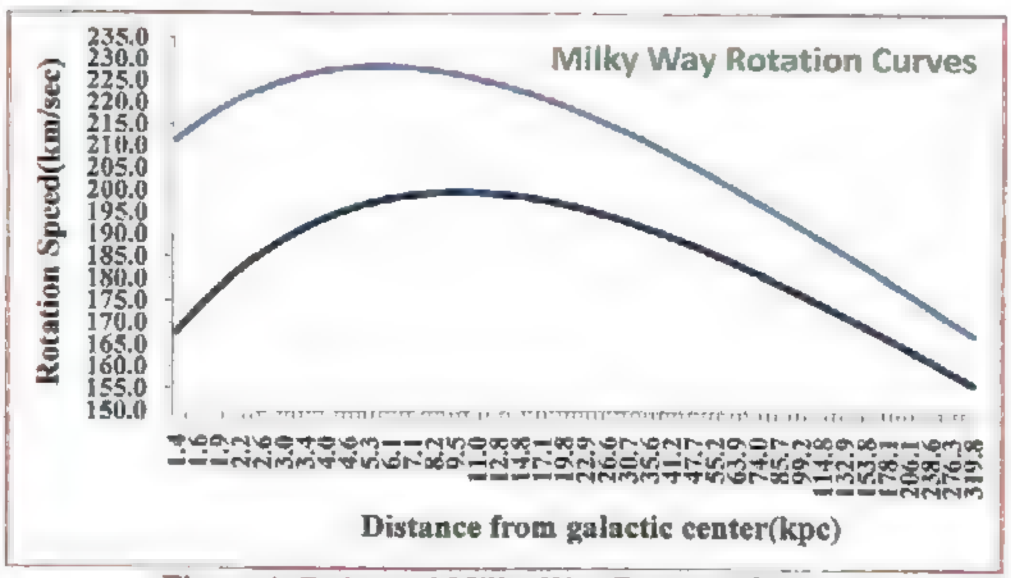

Figure 4: Estimated Milky Way Rotation Curves

Considering relations (19) and (20) and by knowing the galactic flat rotation speeds, galactic total masses and galactic radii can be estimated without the need of currently believed 'dark matter halo' concepts and their complicated analytical procedures.

Based on relations (19) to (24), one can understand the potential applications of current cosmic angular velocity or rotation speed in exploring the constructional secrets of galaxies. It needs further study.

It may be noted that, considering a rotating and expanding model of cosmology, it seems possible to say that,

1) Galaxies seem to follow an outward spiral path.
2) Galaxies can be seemed to be arranged in a systematic order.
3) Even though present universe is believed to be accelerating, as current expansion rate is very small, increase in separation distance between neighboring galaxies seems to be negligible. Hence, distance between neighboring galaxies seems to be approximately fixed.

Based on the new red shift definition as discussed in section (7), various distances associated with galactic light can be understood in the following way.

Light Travel Distance can be approximated with,

$$LTD \cong z_{new}\left(\frac{c}{\omega_0}\right) \tag{25}$$

Comoving Distance can be approximated with,

$$CD \cong \exp(z_{new}) * LTD \tag{26}$$

Hence, Hubble's law for galactic comoving distances can be expressed as,

$$CD_{gal} \cong z_{new}\exp(z_{new}) * \left(\frac{c}{\omega_0}\right) \text{ where } z_{new} \leq 1 \tag{27}$$

For Lambda model of cosmology, corresponding receding speed of a galaxy can be expressed as, $V_{gal} \cong [z_{new}\exp(z_{new})]c \cong \left[\left(\frac{z}{1+z}\right)\exp\left(\frac{z}{1+z}\right)\right]c$

For $z_{new} \cong 1$, $CD_{gal} \cong \exp(1) * \left(\frac{c}{\omega_0}\right) \cong 2.7183\left(\frac{c}{\omega_0}\right) \cong 39.74$ Gly.

It may be noted that, according to Lambda model of cosmology, radius of observable universe is around 45 Gly.

Luminosity Distance can be approximated with,

$$LD \cong \frac{CD}{1-z_{new}} \cong \left(\frac{z_{new}\exp(z_{new})}{1-z_{new}}\right)\left(\frac{c}{a_0}\right) \tag{28}$$

See Fig. 5 and Table 3. See Appendix A for the C++ program.

Column Details of Table 3

Column-1: Red shift
Column-2: Modified Red shift
Column-3: Light travel distance as per Lambda Cosmology (Gly)
Column-4: Light travel distance in Hubble-Hawking Cosmology (Gly)
Column-5: % error in Light travel distance (Blue curve in the graph)
Column-6: Comoving distance as per Lambda Cosmology (Gly)
Column-7: Comoving distance in Hubble-Hawking Cosmology (Gly)
Column-8: % error in Comoving distance (Red curve in the graph)
Column-9: Luminosity distance as per Lambda Cosmology (Gly)
Column-10: Luminosity distance in Hubble-Hawking Cosmology (Gly)
Column-11: % error in Luminosity distance (Red curve in the graph)

Note-1: LC = Lambda cosmology and HHC = Hubble-Hawking cosmology
Note-2: Numerically, columns 8 and 11 are almost same.

Data values: H_0 = 66.89 km/sec/Mpc;
Matter density %= 0.32%;
Dark energy density %= 0.68%

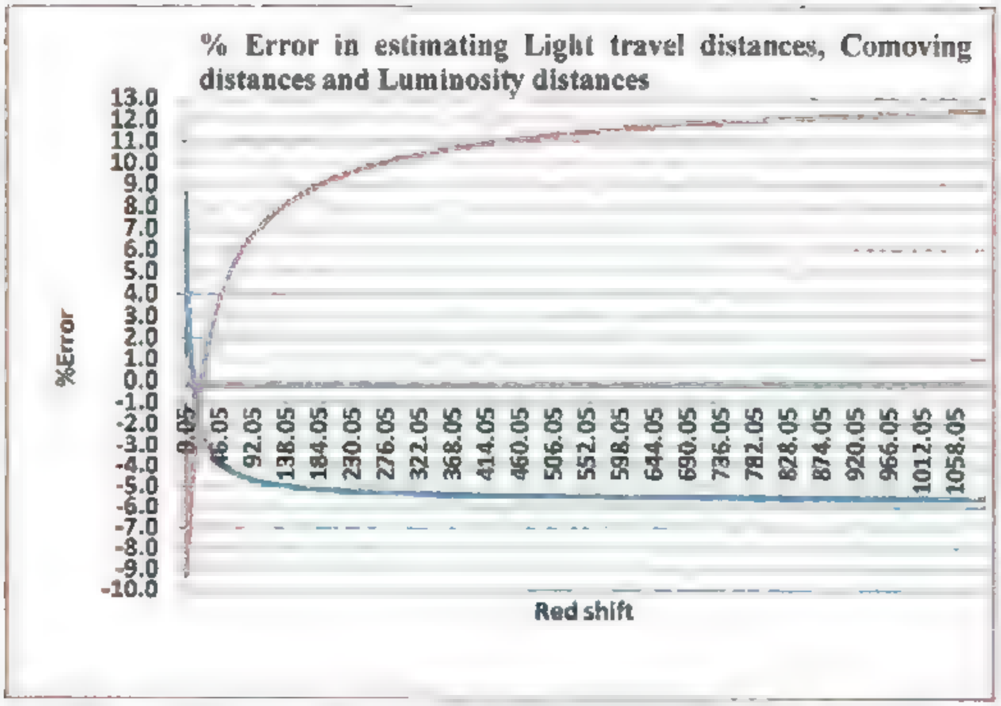

Figure 5: Comparative study of various cosmological distances

Table 3: Various cosmological distances estimated with true cosmic red shift

z	c/(1+z)	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	LD_LC	LD_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	[illegible]	(11)
0.05	[illegible]	0.704	0.696	1.174	0.722	0.730	-1.149	0.76	0.767	1.149
1.05	3.512	8.188	7.487	8.558	11.545	12.495	-8.233	[illegible]	[illegible]	-8.233
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	11.735	11.008	6.197	21.335	21.376	-0.059	86.81	94.674	0.059
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.05	0.835	12.681	12.201	3.784	26.056	25.114	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8.05	[illegible]	[illegible]	[illegible]	1.526	29.875	31.848	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30.748	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	13.295	0.545	31.501	[illegible]	-4.794	348.09	[illegible]	[illegible]
[illegible]	[illegible]	13.424	13.404	0.149	32.158	33.535	-4.283	387.50	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.569	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	-1.626	35.198	35.723	-1.493	670.52	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	36.494	36.530	-0.101	877.60	878.574	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	36.711	36.655	0.152	919.61	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	36.770	0.368	[illegible]	957.959	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27.05	0.964	13.719	14.096	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.726	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1087.81	[illegible]	1.009

Z	[illegible]	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	LD_LC	LD_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
29.05	0.967	13.731	14.131	-2.915	37.600	37.155	1.184	1129.87	1116.500	1.184
30.05	0.968	13.736	14.147	-2.991	37.756	37.236	1.378	1172.33	1156.170	1.378
[illegible]	0.969	13.740	14.161	-3.064	37.901	[illegible]	1.553	[illegible]	1195.850	1.553
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.748	14.188	[illegible]	[illegible]	37.451	1.874	1299.57	1275.210	1.874
34.05	0.971	13.752	14.200	-3.258	38.303	37.515	2.056	[illegible]	1314.900	2.056
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	37.575	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.340
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
38.05	0.974	13.765	14.243	-3.476	38.756	37.738	2.627	1513.42	1473.660	2.627
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
40.05	0.976	13.770	14.261	-3.572	38.951	37.833	2.869	[illegible]	1553.060	2.869
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.977	13.774	14.278	[illegible]	39.151	37.920	3.143	1685.44	1612.460	3.141
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.783	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.980	13.785	14.319	-3.878	39.638	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.325	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13.788	14.331	[illegible]	[illegible]	38.200	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.337	[illegible]	[illegible]	38.229	4.082	[illegible]	[illegible]	[illegible]
		[illegible]	14.342	[illegible]	[illegible]	38.257	[illegible]	[illegible]	[illegible]	[illegible]
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		[illegible]	14.366	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	14.370	[illegible]	[illegible]	[illegible]	4.600	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
60.05	0.984	13.799	14.378	-4.198	40.395	38.448	4.818	2466.10	2347.280	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.955
		[illegible]	[illegible]	[illegible]	[illegible]	38.508	5.051	[illegible]	[illegible]	5.051
		[illegible]	[illegible]	[illegible]	[illegible]	38.527	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2545.970	5.202
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.257	[illegible]	[illegible]	[illegible]
		[illegible]	14.403	-4.335	[illegible]	[illegible]	5.313	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2816.29	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.430	2860.06	2704.770	5.430
		13.806	[illegible]	-4.387	[illegible]	[illegible]	5.491	2903.94	2744.480	5.491
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.554	[illegible]	2784.210	5.554
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2823.930	5.618
		[illegible]	14.420	[illegible]	[illegible]	[illegible]	5.684	3036.22	2863.650	5.684
[illegible]		[illegible]	14.423	-4.448	[illegible]	38.686	[illegible]	3080.54	2903.380	5.751
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3124.97	2943.100	5.820
[illegible]		[illegible]	14.428	-4.478	[illegible]	[illegible]	[illegible]	[illegible]	2982.820	[illegible]
[illegible]		[illegible]	14.430	-4.491	[illegible]	[illegible]	[illegible]	[illegible]	3022.550	5.910
	[illegible]	[illegible]	14.433	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3062.280	[illegible]
		[illegible]	14.435	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.005
		[illegible]	14.437	[illegible]	[illegible]	38.763	[illegible]	3345.13	3141.730	6.080
	[illegible]	13.812	[illegible]	-4.544	[illegible]	38.775	6.105	3388.29	3181.440	6.105
		[illegible]	[illegible]	-4.556	[illegible]	[illegible]	6.182	3431.44	3221.180	6.182
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3260.900	6.208
[illegible]	[illegible]	[illegible]	14.446	[illegible]	[illegible]	38.808	6.235	[illegible]	3300.630	6.235
[illegible]		[illegible]	14.448	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3340.350	6.316
[illegible]		[illegible]	14.450	[illegible]	[illegible]	[illegible]	6.345	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.374	[illegible]	[illegible]	6.374
[illegible]		[illegible]	14.453	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	14.455	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
90.05	0.989	13.815	14.457	-4.647	41.580	38.869	6.521	3785.85	3538.980	6.521
91.05	0.989	13.815	14.459	-4.658	41.604	38.878	6.553	3829.67	3578.710	6.553
[illegible]	0.989	13.816	14.460	-4.666	41.653	38.887	6.641	3875.84	3618.450	6.641
93.05	0.989	13.816	14.462	-4.676	41.678	38.896	6.675	3919.82	3658.170	6.675
[illegible]	0.989	13.816	14.464	4.686	41.703	38.905	6.710	3963.85	3697.910	6.709
[illegible]	[illegible]	[illegible]	14.465	[illegible]	[illegible]	38.913	6.745	4007.95	[illegible]	[illegible]

Z	[illegible]	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	LD_LC	LD_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		[illegible]	14.467	-4.705	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.468	-4.714	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.817
[illegible]	[illegible]	13.817	14.470	-4.723	41.803	38.938	6.854	4140.61	3856.820	6.854
[illegible]	[illegible]	13.818	14.471	-4.732	41.829	38.946	6.892	4184.96	3896.550	6.892
		13.818	[illegible]	-4.740	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.990	13.818	14.474	-4.749	41.880	38.961	6.969	4273.84	3975.990	6.969
[illegible]	[illegible]	13.818	14.476	-4.757	41.906	38.969	7.008	4318.38	4015.710	7.009
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.819	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.991	13.820	14.483	-4.804	42.037	39.011	7.199	4584.08	4254.390	7.199
[illegible]	0.991	13.820	14.485	-4.811	42.063	39.017	7.242	4629.05	4293.820	7.242
[illegible]	0.991	13.820	14.486	-4.818	42.090	39.024	7.285	4674.08	4333.560	7.285
[illegible]	[illegible]	13.820	14.487	-4.824	42.117	39.030	7.330	4719.18	4373.280	7.330
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.374	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.991	13.821	14.493	-4.857	42.226	39.060	7.498	4942.52	[illegible]	7.498
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.485
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.822	14.497	-4.884	42.281	39.082	7.567	5118.14	4730.870	7.567
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.992	13.822	14.499	-4.895	42.337	39.092	7.664	5209.60	4810.310	7.665
		13.822	[illegible]	-4.901	[illegible]	[illegible]	7.652	[illegible]	[illegible]	7.653
		13.822	14.501	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.823	14.502	-4.912	42.394	39.108	7.752	5343.76	4929.500	7.752
		13.823	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.823	14.503	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13.823	14.504	[illegible]	[illegible]	39.122	[illegible]	[illegible]	[illegible]	7.843
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.832
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.993	13.824	14.510	-4.965	42.539	39.153	7.959	5787.43	5326.800	7.959
		13.824	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.993	13.824	14.512	-4.973	42.598	39.162	8.067	5880.69	5406.280	8.067
[illegible]	0.993	13.824	14.512	-4.978	42.598	39.166	8.058	5923.29	5446.010	8.058
[illegible]	0.993	13.824	14.513	-4.982	42.628	39.170	8.113	5970.08	5485.760	8.112
[illegible]	[illegible]	13.824	14.514	-4.987	42.628	39.174	8.104	6012.71	5525.480	8.103
[illegible]	0.993	13.825	14.515	-4.991	42.658	39.178	8.159	6059.62	5565.190	8.159
[illegible]	0.993	13.825	14.515	-4.996	42.658	39.182	8.150	6102.28	5604.940	8.150
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.825	14.517	-5.005	42.689	39.189	8.198	6192.00	5684.400	8.198
[illegible]	0.993	13.825	14.517	-5.008	42.719	39.193	8.255	6219.16	5724.130	8.255
[illegible]	[illegible]	13.825	14.518	-5.013	42.719	39.197	8.246	[illegible]	5763.860	8.246
[illegible]	0.993	13.825	14.519	-5.018	42.719	39.200	8.238	6324.60	5803.610	8.238
[illegible]	0.993	13.825	14.519	-5.021	42.750	39.204	8.296	6371.90	5843.320	8.296
[illegible]	0.993	13.825	14.520	-5.026	42.750	39.207	8.287	6414.65	5883.050	8.287
[illegible]	[illegible]	13.825	14.521	-5.029	42.781	39.211	8.346	6462.09	5922.770	8.346
[illegible]	0.993	13.825	14.521	-5.034	42.781	39.214	8.338	6504.87	5962.520	8.338
[illegible]		[illegible]	14.522	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.448	[illegible]	[illegible]	8.448
		[illegible]	[illegible]	[illegible]	[illegible]	39.228	8.441	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.826	14.524	-5.053	42.844	39.231	8.433	6728.62	6161.190	8.433
		13.826	[illegible]	[illegible]	[illegible]	39.234	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13.826	[illegible]	[illegible]	[illegible]	39.237	8.486	[illegible]	[illegible]	[illegible]
	[illegible]	13.826	[illegible]	5.062	[illegible]	39.240	8.547	[illegible]	[illegible]	8.547
[illegible]	[illegible]	[illegible]	14.527	[illegible]	[illegible]	39.243	8.540	[illegible]	[illegible]	8.540
[illegible]	0.994	13.826	14.527	-5.070	42.908	39.246	8.533	6953.16	6359.840	8.533
[illegible]	0.994	13.826	14.528	-5.073	42.940	39.249	8.595	7001.31	6399.580	8.595

[illegible]	[illegible]	LTD LC	LTD HHC	%Error	CD LC	CD HHC	%Error	LD LC	LD HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
63.05	.994	13.826	14.528	-5.077	42.940	39.252	8.588	7044.25	6439.300	8.588
64.05	0.994	13.826	14.529	-5.081	42.940	39.255	8.581	7087.19	6479.050	8.581
		13.827	14.529	-5.083	42.972	39.258	[illegible]	[illegible]	[illegible]	8.643
[illegible]	0.994	13.827	14.530	-5.087	42.972	39.261	8.637	7178.49	6558.520	8.637
		13.827	14.530	-5.090	42.972	39.264	8.630	722[illegible].46	6598.2[illegible]0	8.631
68.05	0.994	13.827	14.531	-5.093	43.005	39.266	8.693	7269.96	6637.970	8.693
69.05	0.994	13.827	14.532	-5.097	43.005	39.269	8.687	7312.97	6677.730	8.687
[illegible]		13.827	14.532	[illegible]	43.038	39.272	8.75[illegible]	[illegible]	[illegible]	8.75[illegible]
71.05	0.994	13.827	14.533	-5.102	43.038	39.274	8.744	7404.65	6757.130	8.745
		13.827	14.533	-5.106	43.038	39.277	8.736	[illegible]	[illegible]	8.738
73.05	.994	13.827	14.533	-5.108	43.071	39.280	8.801	7496.51	6836.630	8.801
		13.827	14.534	[illegible]	43.07[illegible]	39.282	8.79[illegible]	[illegible]	[illegible]	8.796
		13.827	14.534	[illegible]	[illegible]	39.285	[illegible]	[illegible]	[illegible]	8.79[illegible]
		13.827	14.535	[illegible]	[illegible]	39.287	8.856	[illegible]	[illegible]	8.856
		13.827	14.535	-5.120	[illegible]	[illegible]	8.85[illegible]	[illegible]	[illegible]	8.850
		13.827	14.536	5.124	[illegible]	[illegible]	8.84[illegible]	[illegible]	[illegible]	8.84[illegible]
		13.827	14.53[illegible]	5.127	[illegible]	39.295	8.8[illegible]	[illegible]	[illegible]	8.8[illegible]
		13.828	14.537	5.129	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.828	14.537	5.132	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.828	14.538	5.135	43.138	[illegible]	8.89[illegible]	[illegible]	[illegible]	8.894
		13.828	14.538	-5.137	43.172	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.828	14.538	-5.140	43.172	[illegible]	8.955	[illegible]	[illegible]	8.95[illegible]
		13.828	14.539	-5.143	43.172	[illegible]	8.949	[illegible]	[illegible]	8.949
		13.828	14.539	-5.145	43.207	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.828	14.539	5.148	43.207	[illegible]	9.01[illegible]	[illegible]	[illegible]	[illegible]
		13.828	14.540	-5.15[illegible]	43.207	[illegible]	9.006	[illegible]	[illegible]	[illegible]
		13.828	14.541	5.153	43.207	39.318	9.001	[illegible]	[illegible]	[illegible]
		13.828	14.541	5.155	43.242	39.320	9.06[illegible]	[illegible]	[illegible]	[illegible]
		13.828	14.541	5.158	43.242	39.322	[illegible]	[illegible]	[illegible]	[illegible]
		13.828	14.542	5.161	43.242	39.324	9.059	[illegible]	7591.55[illegible]	9.05[illegible]
		13.828	14.542	-5.164	43.242	39.326	9.054	[illegible]	[illegible]	[illegible]
		13.828	14.543	5.165	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.828	14.544	5.168	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
96.05	0.995	13.828	14.543	5.170	[illegible]	[illegible]	9.114	[illegible]	[illegible]	[illegible]
		13.828	14.544	-5.172	[illegible]	39.335	[illegible]	[illegible]	[illegible]	[illegible]
		13.828	14.544	5.175	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.828	14.544	5.177	[illegible]	39.339	9.174	[illegible]	[illegible]	9.174
		13.828	14.545	5.180	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.169
20[illegible].05	0.995	13.829	14.545	-5.181	43.348	39.342	9.240	8758.19	7949.130	9.240
		13.829	14.545	-5.184	[illegible]	39.344	9.235	[illegible]	[illegible]	9.235
		13.829	14.546	5.186	[illegible]	39.346	9.231	[illegible]	[illegible]	[illegible]
		13.829	14.546	5.189	[illegible]	39.348	9.227	[illegible]	[illegible]	9.226
205.05	0.995	13.829	14.547	5.19[illegible]	43.348	39.350	9.222	[illegible]	[illegible]	9.222
		13.829	14.547	5.192	43.384	39.352	[illegible]	[illegible]	[illegible]	[illegible]
		13.829	14.547	5.195	43.384	39.354	9.284	[illegible]	[illegible]	9.284
208.05	0.995	13.829	14.548	5.197	43.384	39.355	[illegible]285	[illegible]	[illegible]	9.285
209.05	0.995	13.829	14.548	5.20[illegible]	[illegible]	39.357	9.281	[illegible]	[illegible]	9.28[illegible]
210.05	0.995	13.829	14.548	5.20[illegible]	[illegible]	39.359	9.351	[illegible]	[illegible]	9.35[illegible]
211.05	0.995	13.829	14.549	5.2[illegible]	43.420	[illegible]	[illegible]	[illegible]	[illegible]	9.340
212.05	0.995	13.829	14.549	-5.2[illegible]	43.42[illegible]	39.363	9.345	[illegible]	[illegible]	9.345
[illegible]		13.829	14.549	5.208	[illegible]	[illegible]	9.34[illegible]	[illegible]	[illegible]	9.34[illegible]
[illegible]	0.995	13.829	14.549	5.21[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.995	13.829	14.55[illegible]	5.21	43.457	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.995	13.829	14.551	5.213	43.457	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.995	13.829	14.550	5.216	43.457	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
218.05		13.829	14.551	5.218	43.457	39.373	[illegible]	[illegible]	[illegible]	[illegible]
219.05	0.995	13.829	14.551	5.2[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
220.05		13.829	14.551	-5.22[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.995	13.829	14.552	5.223	43.494	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
222.05	[illegible]	13.829	14.552	-5.225	43.494	[illegible]	9.460	[illegible]	[illegible]	9.460
223.05	0.996	13.829	14.552	-5.227	43.494	39.381	9.457	[illegible]	[illegible]	9.457
224.05	.996	13.830	14.553	-5.228	43.531	39.382	9.53[illegible]	[illegible]	[illegible]	9.53[illegible]
[illegible]		13.830	14.553	5.2[illegible]	43.531	39.384	9.528	[illegible]	[illegible]	9.528
[illegible]		13.830	14.553	-5.232	43.531	39.385	9.524	[illegible]	[illegible]	9.524
		13.830	14.553	5.234	43.531	39.387	9.521	[illegible]	[illegible]	[illegible]
[illegible]		13.830	14.554	5.236	[illegible]	39.389	[illegible]	[illegible]	[illegible]	9.517
229.05	0.996	13.830	14.554	-5.237	43.569	39.390	9.593	10023.10	9061.600	9.593

Z	z/(1+z)	LTD LC	LTD HHC	%Error	CD LC	CD HHC	%Error	LD LC	LD HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
[illegible]		[illegible]	[illegible]	-5.239	[illegible]	[illegible]	[illegible]	[illegible]	9101.380	9.589
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10110.30	9141.120	9.586
		13.830	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10153.80	9180.830	9.583
		[illegible]	[illegible]	-5.245	[illegible]	[illegible]	[illegible]	[illegible]	9220.620	9.579
[illegible]		[illegible]	14.555	-5.247	[illegible]	39.397	9.576	10241.00	9260.350	9.575
		[illegible]	14.556	-5.247	43.608	39.399	9.652	10293.60	9300.040	9.652
		13.830	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10337.20	[illegible]	[illegible]
237.05	0.996	13.830	14.556	-5.251	43.608	39.402	9.646	10380.80	9379.480	9.646
238.05	0.996	13.830	14.556	-5.253	43.608	39.403	9.642	10424.40	9419.240	9.643
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.255	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.830	[illegible]	5.257	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	-5.259	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.830	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	14.558	5.263	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.558	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.701
		[illegible]	14.555	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.996	13.830	14.559	-5.272	43.686	39.419	9.768	[illegible]	9896.080	9.767
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.765
		[illegible]	[illegible]	5.275	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.762
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.841
		[illegible]	[illegible]	5.277	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.560	-5.279	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.832
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.284	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	13.830	14.561	-5.284	43.766	39.430	9.907	[illegible]	10253.700	9.907
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
263.05	0.996	[illegible]	14.562	[illegible]	[illegible]	[illegible]	[illegible]	11556.30	10412.600	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11600.00	10452.400	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.891
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.563	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.564	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
271.05	0.996	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.960	11912.50	10730.400	9.961
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.958	[illegible]	10770.100	9.958
[illegible]		13.831	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.831	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.831	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	14.565	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10.026
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	43.859	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.320	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.323	43.931	39.461	10.175	12742.20	11445.800	10.175
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	-5.324	43.931	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13.831	[illegible]	5.325	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	13.831	14.568	-5.326	[illegible]	[illegible]	10.167	[illegible]	[illegible]	[illegible]
		[illegible]	14.568	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	13.831	14.568	[illegible]	[illegible]	[illegible]	10.163	13005.80	11684.100	10.163
[illegible]	0.997	13.831	14.568	[illegible]	[illegible]	[illegible]	10.161	13049.80	11723.900	10.160

Z	z (1+z)	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	LD_LC	LD_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
[illegible]	[illegible]	13.83	14.569	5.331	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.83	14.569	5.331	43.974	[illegible]	10.244	[illegible]	[illegible]	[illegible]
		13.83	14.569	5.332	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.997	13.831	14.569	-5.334	43.974	39.471	10.240	11238.40	11882.700	10.240
		[illegible]	14.569	5.335	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
303.05	0.997	13.831	14.569	-5.337	43.974	39.474	10.234	13370.30	12002.000	10.234
304.05	0.997	13.831	14.570	-5.338	43.974	39.474	10.232	13414.30	[illegible]	10.232
305.05	0.997	13.831	14.570	-5.339	43.974	39.475	10.231	13458.20	[illegible]	10.231
		13.831	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
307.05	0.997	13.831	14.570	-5.341	44.017	39.477	10.315	[illegible]	12160.800	10.316
		13.831	14.570	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.997	13.831	14.570	-5.343	44.017	39.479	10.311	13647.60	12240.400	10.311
310.05	0.997	13.831	14.570	-5.344	44.017	39.479	10.310	[illegible]	12280.100	10.309
		[illegible]	[illegible]	5.345	[illegible]	39.480	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.997	13.831	14.571	-5.348	44.017	39.483	10.302	13867.70	12418.900	10.303
[illegible]	0.997	13.831	14.571	-5.349	44.017	39.483	10.300	13911.70	12478.700	10.300
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.831	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.572	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.572	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.353	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.572	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
322.05	0.997	13.831	14.572	-5.355	44.061	39.489	10.378	14214.00	12756.800	10.378
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10.371
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
327.05	[illegible]	13.832	14.573	-5.359	44.106	39.493	10.460	14469.00	12955.600	10.460
328.05	0.997	13.832	14.573	-5.360	44.106	39.493	10.458	14513.10	12995.200	10.459
329.05	0.997	13.832	14.573	-5.361	44.106	39.494	10.457	14557.20	13035.100	10.456
		[illegible]	14.573	5.362	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.573	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.832	14.574	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	14.574	5.365	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.574	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.832	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.832	14.574	-5.368	44.106	39.499	10.446	14866.00	13313.000	10.446
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
338.05	0.997	13.832	14.574	-5.369	44.152	39.500	10.534	14969.60	13392.600	10.534
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.832	14.575	-5.372	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
342.05	0.997	13.832	14.575	-5.172	44.152	39.503	10.528	15146.20	13551.600	10.528
		[illegible]	[illegible]	[illegible]	44.152	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
345.05	0.997	13.832	14.575	-5.375	44.152	39.505	10.524	15278.60	[illegible]	10.524
		13.832	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
348.05	0.997	13.832	14.576	-5.378	44.152	39.507	10.519	[illegible]	13790.100	10.519
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
350.05	[illegible]	13.832	14.576	-5.378	44.198	39.508	[illegible]	[illegible]	13869.300	10.611
[illegible]	0.997	13.832	14.576	-5.379	44.198	39.509	10.608	15559.80	13909.100	10.609
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
353.05	0.997	13.832	14.576	-5.381	44.198	39.510	10.605	15648.20	13988.500	10.606
354.05	0.997	13.832	14.576	-5.382	44.198	39.511	10.604	15692.40	14028.400	10.604
		13.832	[illegible]	5.383	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.384	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
357.05	0.997	13.832	14.577	-5.384	44.198	39.513	10.600	15824.90	14147.600	10.599
[illegible]	[illegible]	[illegible]	14.577	5.385	[illegible]	[illegible]	10.598	[illegible]	[illegible]	[illegible]
359.05	0.997	13.832	14.577	-5.386	44.198	39.514	10.597	[illegible]	14227.000	10.597
		13.832	[illegible]	[illegible]	[illegible]	[illegible]	10.596	[illegible]	[illegible]	[illegible]
	[illegible]	13.832	[illegible]	5.388	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.577	5.388	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	14.577	5.388	44.244	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Z	Z 1+	LTD LC	LTD HHC	%Error	CD LC	CD HHC	%Error	LD LC	LD HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
364 05	0 997	13 832	14 577	-5 389	44 244	[illegible]	10 685	[illegible]	14425 600	10 685
365 05	0 997	13 832	14 578	[illegible]	44 244	[illegible]	10 683	16195 70	14465 500	10 683
366 05	0 997	13 832	14 578	[illegible]	44 244	39 518	10 682	16239 90	14505 200	10 682
367 05	[illegible]	13 832	14 578	[illegible]	44 244	39 519	10 681	16284 20	14544 900	10 681
		13 832	14 578	[illegible]	44 244	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 832	14 578	[illegible]	44 244	39 520	10 678	[illegible]	[illegible]	[illegible]
		13 832	14 578	5 394	[illegible]	39 521	10 677	[illegible]	[illegible]	[illegible]
		13 832	14 578	5 394	[illegible]	[illegible]	10 676	[illegible]	[illegible]	[illegible]
		13 832	14 579	5 395	44 244	39 522	[illegible]	[illegible]	[illegible]	10 674
		13 832	14 578	[illegible]	44 244	39 522	10 673	[illegible]	[illegible]	10 673
		13 832	14 578	[illegible]	44 244	39 523	10 672	[illegible]	[illegible]	[illegible]
		13 832	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 832	[illegible]	5 398	44 244	[illegible]	[illegible]	[illegible]	[illegible]	10 669
		13 832	[illegible]	-5 398	[illegible]	39 525	[illegible]	[illegible]	[illegible]	[illegible]
		13 832	14 579	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	13 832	14 579	-5 399	44 292	39 526	10 762	16833 20	[illegible]	10 762
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16877 50	15061 400	10 760
		13 832	14 579	[illegible]	[illegible]	39 527	[illegible]	[illegible]	[illegible]	[illegible]
		13 832	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10 758
		13 832	14 579	[illegible]	[illegible]	39 528	10 757	[illegible]	[illegible]	10 757
		[illegible]	14 580	[illegible]	[illegible]	39 528	[illegible]	[illegible]	[illegible]	10 756
		13 832	14 580	5 404	[illegible]	39 529	[illegible]	[illegible]	[illegible]	[illegible]
386 05	0 997	13 832	14 580	5 405	[illegible]	39 529	[illegible]	[illegible]	15300 000	10 752
		13 832	14 580	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 832	14 580	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 832	14 580	[illegible]	[illegible]	[illegible]	[illegible]	17276 10	[illegible]	[illegible]
[illegible] 05	[illegible]	13 832	14 580	-5 407	44 292	39 531	10 748	[illegible]	[illegible]	[illegible]
		13 832	[illegible]	-5 408	44 292	39 532	[illegible]	[illegible]	[illegible]	[illegible]
		13 832	[illegible]	-5 408	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 832	14 580	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15578 100	10 842
		13 832	14 580	-5 409	[illegible]	[illegible]	[illegible]	17516 70	15617 600	10 842
		13 832	[illegible]	[illegible]	[illegible]	[illegible]	10 840	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] 05	0 997	13 832	14 581	[illegible]	44 341	39 535	10 838	17649 70	15736 700	10 839
		13 832	14 581	[illegible]	44 341	[illegible]	10 837	[illegible]	[illegible]	[illegible]
		[illegible]	14 581	-5 412	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 581	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403 05	0 998	13 832	14 581	-5 415	44 341	39 538	10 831	17915 80	15975 200	[illegible]
		13 832	[illegible]	[illegible]	[illegible]	39 538	10 830	17960 10	16015 100	10 830
		13 832	[illegible]	5 416	44 341	39 539	10 829	[illegible]	16054 800	10 829
		13 832	[illegible]	5 417	44 341	39 539	10 828	18048 80	16094 400	10 829
		13 832	14 582	-5 418	44 341	39 540	[illegible]	[illegible]	[illegible]	[illegible]
		13 832	14 582	[illegible]	[illegible]	39 540	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 582	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5 420	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5 420	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 582	5 421	[illegible]	39 543	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 582	5 422	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 582	5 422	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] 05		[illegible]	[illegible]	5 424	[illegible]	39 545	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 583	5 424	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	5 425	[illegible]	39 546	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13 832	[illegible]	5 425	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	14 583	-5 426	[illegible]	39 547	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	14 583	-5 426	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 583	5 427	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10 208
		[illegible]	14 583	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	14 583	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13 833	14 583	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	13 833	[illegible]	-5 428	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0 998	[illegible]	[illegible]	5 429	[illegible]	39 550	[illegible]	[illegible]	17005 500	[illegible]
[illegible]	[illegible]	13 833	14 584	5 430	[illegible]	39 550	[illegible]	[illegible]	17048 100	[illegible]

T	[illegible]	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	LD_LC	LD_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		13 833	4 584	5 430	44 440	39 551	11 002	19200 30	17087 700	11 003
		13 833	4 584	5 431	44 440	[illegible]	[illegible]	19244 80	17127 600	11 001
		13 833	14 584	5 431	44 440	39 552	[illegible]	9289 20	17167 200	11.001
		13 833	14 584	-5 432	44.440	39 552	11 000	19333 70	17207 000	11 000
		13 833	14 584	5 432	44 44	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		3 833	14 584	5 433	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		3 833	4 584	-5 434	[illegible]	3 553	[illegible]	[illegible]	[illegible]	10 997
438 05	0 998	13 833	14 584	-5 434	44 440	39 554	10 996	19511 40	17365 800	10 997
439 05	0 998	13 833	14 584	-5 435	44 440	39 554	10 995	19555 90	17405 600	10 996
		13 833	4 584	5 435	[illegible]	39 554	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	4 584	[illegible]	[illegible]	39 555	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	4 584	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	4 585	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		3 833	14 585	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		3 833	4 585	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		3 833	4 585	5 438	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		3 833	4 585	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	4 585	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
449 05	0 998	13 833	4 585	[illegible]	[illegible]	[illegible]	[illegible]	20023 30	17802 900	11 089
450 05	0 998	13 833	14 585	[illegible]	[illegible]	39 558	[illegible]	20067 80	17842 800	11 088
		13 833	14 585	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11 088
		[illegible]	14 585	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	4 585	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
454 05	0 998	13 833	14 585	5 442	44 491	39 560	11 084	20245 80	[illegible]	[illegible]
		13 833	[illegible]	5 442	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	4 585	5 441	[illegible]	39 561	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	4 586	5 443	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	14 586	5 444	[illegible]	[illegible]	11 081	[illegible]	[illegible]	[illegible]
		3 833	14 586	5 444	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 586	5 445	[illegible]	39 562	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	4 586	5 445	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	4 586	5 446	44 491	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	4 586	-5 446	44 491	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	14 586	5 447	44 491	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	[illegible]	-5 446	44 544	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	14 586	447	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 586	5 447	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1 178
		3 833	4 586	5 448	44 541	[illegible]	11 177	[illegible]	[illegible]	1 178
		13 833	4 586	5 448	[illegible]	39 566	[illegible]	[illegible]	[illegible]	11 175
		13 833	[illegible]	5 449	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	4 587	5 449	[illegible]	39 566	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	14 587	5 450	44 544	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		3 833	14 587	5 450	44 544	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		3 833	4 587	5 45	44 544	39 567	11 172	[illegible]	[illegible]	[illegible]
		3 833	4 587	5 451	44 544	39 568	[illegible]	[illegible]	[illegible]	11 172
		3 833	4 587	-5 452	44 544	[illegible]	[illegible]	[illegible]	[illegible]	11 171
477 05	0 998	13 833	4 587	5 452	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
478 05	0 998	13 833	14 587	-5 452	44 544	[illegible]	[illegible]	2 338 60	18955 300	11 169
479 05	0 998	13 833	[illegible]	-5 453	44 544	[illegible]	11 168	2,383 20	18995 000	11 168
480 05	0 998	13 833	14 587	-5 453	[illegible]	39 569	11 167	21427 70	[illegible]	[illegible]
		[illegible]	14 587	-5 454	44 544	[illegible]	11 167	21472 30	19074 500	[illegible]
	0 998	13 833	14 587	-5 454	44 544	39 570	11 166	21516.80	19114 200	11 166
	0 998	13 833	4 587	5 455	44 544	39 570	11 165	21561 30	19154 100	[illegible]
	0 998	13 833	14 587	5 455	[illegible]	[illegible]	11 164	[illegible]	[illegible]	[illegible]
	0 998	13 833	14 587	5 456	44 544	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0 998	13 833	14 587	5 456	44 544	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0 998	13 833	14 588	-5 456	[illegible]	39 572	[illegible]	[illegible]	[illegible]	1 268
		[illegible]	14 588	5 456	44 597	39 572	1 268	[illegible]	[illegible]	1 268
	0 998	3 833	[illegible]	5 457	44 597	[illegible]	[illegible]	21854 80	[illegible]	11 268
	0 998	[illegible]	4 588	5 457	44 597	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	3 833	4 588	5 457	44 597	39 573	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	4 588	5 458	[illegible]	39 573	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	14 588	-5 458	[illegible]	39 574	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	14 588	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 833	14 588	5 459	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		3 833	14 588	[illegible]	[illegible]	39 575	[illegible]	[illegible]	[illegible]	11 263
		13 833	14 588	-5 460	[illegible]	39 575	[illegible]	[illegible]	[illegible]	[illegible]

Z	z/(1+z)	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	LD_LC	LD_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
[illegible]		13 833	[illegible]	[illegible]	[illegible]	39 575	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13 833	14 588	5 461	[illegible]	39 576	11 260	[illegible]	[illegible]	[illegible]
		[illegible]	14 588	-5 461	44 597	39 576	11 259	[illegible]	[illegible]	[illegible]
		[illegible]	14 588	-5 462	44 597	39 576	11 258	[illegible]	[illegible]	[illegible]
		[illegible]	14 588	-5 462	44 597	39 577	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 588	-5 463	44 597	39 577	11 257	[illegible]	[illegible]	[illegible]
		13 833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5 470	44 652	39 583	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	14 590	-5 471	44 652	39 583	[illegible]	[illegible]	[illegible]	[illegible]
526 05	[illegible]	[illegible]	[illegible]	-5 471	44 652	39 584	[illegible]	[illegible]	[illegible]	[illegible]
527 05	0 998	13 833	14 590	-5 471	44 652	39 584	11 349	21578 30	20902 300	11 349
		[illegible]	[illegible]	5 472	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5 472	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13 833	[illegible]	[illegible]	[illegible]	39 585	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 590	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0 998	13 833	14 590	-5 474	44 652	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0 998	13 833	14 590	-5 475	44 652	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0 998	13 833	14 590	-5 475	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13 833	14 590	-5 475	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
539 05	0 998	13 833	14 590	-5 476	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0 998	13 833	14 590	-5 475	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24323 00	21537 800	11 451
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24367 80	21577 800	11 449
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24412 50	21617 300	11 450
		[illegible]	[illegible]	[illegible]	44 707	[illegible]	[illegible]	24457 20	21656 900	11 450
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24501 90	21696 700	11 449
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24546 60	21736 600	11 448
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	44 707	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
552 05	[illegible]	[illegible]	[illegible]	-5 480	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	44 707	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24859 50	22015 000	11 443
		[illegible]	[illegible]	-5 481	[illegible]	[illegible]	[illegible]	24904 20	22054 600	11 442
		[illegible]	[illegible]	-5 481	[illegible]	39 592	[illegible]	24949 00	22094 300	11 442
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	44 707	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	44 707	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5 483	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	13 833	14 592	-5 483	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13 833	14 592	-5 484	44 707	39 594	11 438	25261 90	22372 200	11 439

[illegible]	[illegible]	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	LD_LC	LD_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
569.05	0.998	13.833	14.592	-5.485	44.707	39.595	11.435	25485.40	[illegible]	[illegible]
[illegible]	[illegible]	13.833	14.592	-5.486	44.707	39.595	11.435	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.833	14.592	-5.485	44.765	39.596	11.547	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.544
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25965.70	22968.300	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	23008.200	11.542
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	26055.20	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	39.598	11.541	[illegible]	23087.600	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	39.598	11.541	26144.70	23127.200	11.542
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.540	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	44.765	39.600	11.538	26368.60	23326.000	[illegible]
		[illegible]	[illegible]	[illegible]	44.765	39.600	11.538	26413.30	23365.500	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	39.600	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27129.60	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	44.823	[illegible]	[illegible]	27209.90	24041.600	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.646
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27613.30	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	39.606	11.640	27658.10	24439.000	11.639
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.640	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24597.800	11.638
		[illegible]	[illegible]	[illegible]	44.823	[illegible]	[illegible]	27882.20	24637.200	[illegible]
		13.833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27927.10	24676.700	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.833	14.594	-5.502	44.823	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Z	z/(1+z)	LTD LC	LTD HHC	%Error	CD LC	CD HHC	%Error	LD LC	LD HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
632.05	0.998	13.833	14.594	5.502	44.823	39.609	11.633	28375.30	25074.600	11.632
		[illegible]	[illegible]	[illegible]	44.823	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
634.05	0.998	13.833	14.594	5.503	44.823	39.609	11.632	28465.00	25153.600	[illegible]
635.05	0.998	13.833	14.594	-5.503	44.823	39.610	11.632	[illegible]	25193.800	[illegible]
636.05		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
637.05	0.998	13.833	14.595	-5.503	44.823	39.610	11.631	28599.40	25272.600	[illegible]
		[illegible]	14.595	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25313.200	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.595	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28778.70	25431.700	11.630
		13.833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28823.50	25471.800	11.628
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28868.40	25511.000	11.630
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.627
		[illegible]	14.595	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25590.900	11.746
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25670.200	11.746
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25710.000	11.745
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.595	5.507	[illegible]	[illegible]	11.743	[illegible]	[illegible]	[illegible]
		[illegible]	14.595	5.507	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.595	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.742
		[illegible]	14.595	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.508	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.508	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.509	44.883	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.509	44.883	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.833	[illegible]	[illegible]	44.883	39.615	11.739	29804.80	26306.200	11.739
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.738	[illegible]	[illegible]	[illegible]
		[illegible]	14.596	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
668.05	0.999	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
669.05	0.999	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.596	[illegible]	[illegible]	[illegible]	11.735	[illegible]	[illegible]	[illegible]
672.05	0.999	[illegible]	14.596	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
673.05	0.999	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.512	[illegible]	[illegible]	11.734	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.512	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.596	5.512	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.596	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.513	[illegible]	[illegible]	[illegible]	[illegible]	27021.600	11.731
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27061.300	11.730
		13.833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27101.200	11.730
		[illegible]	14.596	[illegible]	[illegible]	[illegible]	[illegible]	30747.30	27141.100	11.729
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30792.20	27180.100	11.731
		[illegible]	[illegible]	5.515	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.596	-5.515	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.833	14.596	5.515	[illegible]	[illegible]	[illegible]	30926.90	27299.900	11.728
		13.833	14.596	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.596	[illegible]	[illegible]	[illegible]	11.850	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27458.200	11.850
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.596	5.516	44.945	[illegible]	11.848	[illegible]	[illegible]	[illegible]
		13.833	14.596	5.516	[illegible]	39.620	11.848	[illegible]	[illegible]	[illegible]
		13.833	14.596	5.516	[illegible]	39.620	11.847	[illegible]	[illegible]	[illegible]
		13.833	14.597	[illegible]	44.945	[illegible]	11.847	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.833	14.597	[illegible]	44.945	39.621	11.847	[illegible]	[illegible]	[illegible]

Z	[illegible]	LTD LC	LTD HHC	%Error	CD LC	CD HHC	%Error	LD LC	LD HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		13.833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.833	14.597	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.597	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.518	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
735.05	0.999	13.833	14.597	-5.518	44.945	39.622	11.844	31733.60	27975.00	11.844
		[illegible]	[illegible]	5.518	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.597	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.519	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.842	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.833	[illegible]	5.522	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.522	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.522	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.522	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.522	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.837
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.833	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.523	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.598	5.523	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.835	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.524	44.945	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.524	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.598	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.524	[illegible]	[illegible]	11.834	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.525	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.833
		[illegible]	[illegible]	[illegible]	44.945	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.525	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.598	-5.525	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.525	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.525	[illegible]	[illegible]	11.956	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.598	5.526	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	14.598	5.526	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.598	5.526	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.598	5.526	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.598	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.527	[illegible]	[illegible]	11.954	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	-5.527	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	5.527	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	14.598	5.527	[illegible]	39.629	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.527	[illegible]	39.629	[illegible]	[illegible]	[illegible]	[illegible]
756.05	0.999	13.834	14.598	-5.527	45.009	39.629	11.952	34074.00	30001.900	11.951
		[illegible]	[illegible]	-5.528	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.528	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.528	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.598	5.528	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	5.528	[illegible]	[illegible]	11.951	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.598	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	39.631	[illegible]	[illegible]	[illegible]	11.952
		[illegible]	[illegible]	[illegible]	[illegible]	39.631	11.950	[illegible]	30359.000	[illegible]

Z	z/(1+z)	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	LD_LC	LD_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
[illegible]	[illegible]	[illegible]	14 598	5 529	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
767 05	[illegible]	13 834	14 598	-5 529	45 009	39 631	11 949	34569 10	30438 400	11 949
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
770 05	0 999	13 834	14 599	-5 530	45 009	39 631	11 948	34704 20	30557 600	11 948
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
772 05	0 999	13 834	14 599	-5 530	45 009	39 632	11 947	34794 20	30636 700	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
777 05	0 999	13 834	14 599	-5 531	45 009	39 632	11 946	[illegible]	30836 100	11 945
778 05	0 999	13 834	14 599	-5 531	45 009	39 632	11 946	35064 20	30876 300	11 944
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0 999	13 834	14 599	-5 532	45 009	39 633	11 945	35154 30	30955 500	11 944
[illegible]	0 999	13 834	14 599	-5 532	45 009	39 633	11 945	35199 30	30994 600	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0 999	13 834	14 599	-5 532	45 009	39 633	11 944	35289 30	31074 500	11 944
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0 999	13 834	14 599	-5 534	45 009	39 634	11 942	35649 40	31392 200	11 942
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0 999	13 834	14 599	-5 534	45 009	39 635	11 941	35829 40	31550 400	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
805 05	[illegible]	13 834	14 599	-5 535	45 075	39 636	12 067	36332 50	31948 600	12 066
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
822 05	0 999	13 834	14 600	-5 538	45 075	39 638	12 062	37098 80	32624 200	12 061
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13 834	14 600	-5 539	45 075	39 638	12 061	37279 10	32782 200	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
829 05	0 999	13 834	14 600	-5 539	45 075	39 639	12 060	37414 30	32902 500	12 059
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5 540	45 075	39 639	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	[illegible]	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	LD_LC	LD_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
[illegible]		[illegible]	[illegible]	5.540	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.600	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.540	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.540	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13.834	[illegible]	5.541	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
840.05		13.834	[illegible]	-5.541	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
841.05	[illegible]	13.834	14.600	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
842.05	0.999	13.834	14.600	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	14.600	[illegible]	[illegible]	[illegible]	[illegible]	38090.40	33497.200	12.059
[illegible]		13.834	14.600	-5.542	[illegible]	[illegible]	[illegible]	38135.50	33517.900	12.056
[illegible]		[illegible]	[illegible]	-5.542	[illegible]	[illegible]	12.056	38180.60	33576.900	12.058
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.056	38270.70	33657.000	12.056
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.055	[illegible]	33696.300	12.057
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.055	38360.90	33735.700	12.057
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.055	38405.90	33776.900	[illegible]
		[illegible]	[illegible]	5.543	[illegible]	[illegible]	12.055	[illegible]	[illegible]	12.053
		[illegible]	[illegible]	5.543	[illegible]	[illegible]	12.054	38496.10	33856.200	[illegible]
		[illegible]	[illegible]	5.543	[illegible]	[illegible]	[illegible]	[illegible]	33896.000	12.053
[illegible]		13.834	[illegible]	-5.543	[illegible]	[illegible]	[illegible]	[illegible]	33935.800	12.052
		[illegible]	[illegible]	5.543	[illegible]	[illegible]	[illegible]	[illegible]	33974.100	12.056
[illegible]		[illegible]	14.600	5.543	[illegible]	[illegible]	[illegible]	[illegible]	34014.100	12.055
		[illegible]	[illegible]	-5.543	[illegible]	[illegible]	[illegible]	[illegible]	34054.300	12.053
		[illegible]	[illegible]	5.544	[illegible]	[illegible]	[illegible]	[illegible]	34094.500	12.052
		[illegible]	[illegible]	5.544	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.544	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.601	5.544	[illegible]	[illegible]	[illegible]	[illegible]	34252.900	12.052
		[illegible]	14.601	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.054
		[illegible]	[illegible]	5.544	[illegible]	[illegible]	[illegible]	39037.00	34332.700	12.051
		[illegible]	[illegible]	-5.545	[illegible]	[illegible]	[illegible]	39082.10	34371.800	12.052
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.601	5.545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.544	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5.545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	5.545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	5.545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	14.601	5.545	[illegible]	[illegible]	12.181	[illegible]	[illegible]	12.180
		[illegible]	[illegible]	5.546	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.181
		[illegible]	[illegible]	-5.546	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	14.601	5.546	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		13.834	14.601	5.546	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5.546	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	5.547	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	5.547	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	35207.000	12.178
		13.834	[illegible]	[illegible]	[illegible]	[illegible]	12.179	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	14.601	5.547	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14.601	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.548	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
894.05	0.999	13.834	14.601	-5.548	45.143	39.646	12.177	40405.00	35485.600	[illegible]
		13.834	14.601	5.548	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
896.05	[illegible]	13.834	14.601	-5.548	45.143	39.646	12.177	40495.30	35563.600	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	-5.548	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	5.548	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
899.05	0.999	13.834	14.601	5.548	45.143	39.646	12.176	40630.80	35684.000	[illegible]

Z	f(Z)	LTD LC	LTD HHC	%Error	CD LC	CD HHC	%Error	LD LC	LD HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
[illegible]	[illegible]	13.834	[illegible]	5.549	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	-5.549	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.834	[illegible]	-5.549	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	-5.549	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
907.05	0.999	13.834	14.601	-5.549	45.143	39.647	12.175	[illegible]	36001.500	12.174
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	39.647	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.834	[illegible]	-5.550	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.834	14.601	-5.550	45.143	39.647	[illegible]	[illegible]	[illegible]	12.173
[illegible]	[illegible]	[illegible]	14.601	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.999	13.834	14.601	-5.550	45.143	39.647	12.173	41262.80	36239.300	12.174
[illegible]	[illegible]	[illegible]	[illegible]	5.550	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.999	13.834	14.602	-5.550	[illegible]	39.648	[illegible]	41353.00	36315.700	12.174
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.551	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.999	13.834	14.602	-5.551	[illegible]	39.648	[illegible]	41533.60	36478.300	[illegible]
[illegible]	0.999	13.834	14.602	-5.551	45.143	39.648	12.172	[illegible]	[illegible]	[illegible]
[illegible]	0.999	13.834	14.602	-5.551	45.143	39.648	12.172	41623.90	36556.700	12.174
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.172
[illegible]	[illegible]	13.834	[illegible]	5.551	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.552	[illegible]	[illegible]	12.171	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.171	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.552	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.552	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.552	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.552	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	14.602	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.553	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.553	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.834	[illegible]	-5.553	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.553	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.553	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.553	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.554	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.554	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.554	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.834	[illegible]	-5.551	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	-5.554	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	14.602	-5.554	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.554	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.554	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.555	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.555	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	14.602	5.555	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.554	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	5.554	45.213	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	-5.555	[illegible]	39.651	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	-5.555	[illegible]	39.651	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.834	[illegible]	-5.555	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
957.05	0.999	13.834	14.602	-5.555	45.213	39.65	12.302	43316.60	37987.700	12.302
[illegible]	[illegible]	[illegible]	14.602	5.555	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
959.05	0.999	13.834	14.602	-5.555	[illegible]	39.652	12.301	43407.00	38068.300	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	-5.555	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.300
[illegible]	[illegible]	[illegible]	[illegible]	-5.555	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.301
962.05	0.999	13.834	14.602	-5.556	45.213	39.652	12.301	43542.60	38186.500	[illegible]
963.05	0.999	13.834	14.602	-5.556	45.213	39.652	12.300	43587.90	38226.100	[illegible]
964.05	0.999	13.834	14.602	-5.556	45.213	39.652	12.300	43633.10	38265.700	[illegible]
[illegible]	[illegible]	13.834	14.602	[illegible]	[illegible]	[illegible]	12.300	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13.834	14.602	5.556	[illegible]	[illegible]	12.300	[illegible]	[illegible]	12.301

[illegible]	[illegible]	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	LD_LC	LD_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		13 834	[illegible]	5 556	[illegible]	[illegible]	[illegible]	43768 70	38385 200	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	43813 90	38425 200	[illegible]
		[illegible]	[illegible]	5 556	[illegible]	[illegible]	12 299	43859 [illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5 557	45 213	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5 557	45 213	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5 557	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	45 213	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5 557	[illegible]	39 653	12 298	[illegible]	38822 900	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	14 603	-5 558	45 213	39 653	12 297	[illegible]	38902 500	12 296
		[illegible]	[illegible]	5 558	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5 558	[illegible]	39 654	12 297	44446 90	38982 500	12 294
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5 558	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5 558	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 834	[illegible]	5 558	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 834	[illegible]	[illegible]	45 213	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	5 558	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	44853 80	39138 200	12 297
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 834	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 834	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	45125 [illegible]	39577 400	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	45170 30	39617 500	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	39657 700	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	45260 80	39695 700	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	-5 560	45 213	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 834	[illegible]	5 560	45 213	39 655	12 293	45486 80	39896 000	[illegible]
		13 834	[illegible]	[illegible]	45 213	39 655	12 293	45532 00	39934 400	[illegible]
		13 834	[illegible]	[illegible]	45 213	39 656	12 292	45577 20	39975 300	12 291
		13 834	14 603	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	14 603	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13 834	[illegible]	[illegible]	[illegible]	[illegible]	12 292	45758 10	40134 800	[illegible]
		[illegible]	[illegible]	[illegible]	45 213	[illegible]	12 292	45801 30	40173 600	[illegible]
		[illegible]	[illegible]	[illegible]	45 213	[illegible]	12 291	45848 50	40212 500	[illegible]
		13 834	[illegible]	[illegible]	45 213	39 656	12 291	45893 70	40254 000	[illegible]
[illegible]	[illegible]	13 834	14 603	-5 561	45 213	39 656	12 291	45939 00	40293 100	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0 999	13 834	14 603	-5 561	45 213	39 656	12 291	[illegible]	40371 500	12 292
	0 999	13 834	14 603	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0 999	[illegible]	[illegible]	-5 562	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1020 05	0 999	13 834	[illegible]	[illegible]	45 213	39 657	12 290	46165 00	[illegible]	[illegible]
		13 834	[illegible]	-5 562	[illegible]	[illegible]	[illegible]	46210 20	[illegible]	[illegible]
[illegible]		13 834	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	-5 562	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0 999	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0 999	[illegible]	[illegible]	5 562	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12 287
		[illegible]	[illegible]	[illegible]	45 213	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	-5 563	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	5 563	[illegible]	[illegible]	12 288	[illegible]	[illegible]	[illegible]
		13 834	[illegible]	[illegible]	[illegible]	[illegible]	12 288	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	13 834	[illegible]	[illegible]	[illegible]	39 658	12 288	[illegible]	[illegible]	[illegible]

Z	Z (?)	LTD_LC	LTD_HHC	%Error	CD_LC	CD_HHC	%Error	ED_LC	ED_HHC	%Error
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	45.213	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.999	13.834	14.603	-5.563	45.213	39.658	12.288	46888.40	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.999	13.834	14.604	-5.565	45.213	39.659	[illegible]	[illegible]	[illegible]	[illegible]
	0.999	13.834	14.604	-5.565	45.213	39.659	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	45.287	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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		[illegible]	[illegible]	[illegible]	45.287	[illegible]	[illegible]	48232.50	[illegible]	[illegible]
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		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.999	13.834	14.604	-5.566	45.287	39.660	12.424	48458.90	42418.000	12.425
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	45.287	[illegible]	12.424	[illegible]	[illegible]	[illegible]
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		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	[illegible]	[illegible]	[illegible]	12.424	[illegible]	[illegible]	12.424
		[illegible]	[illegible]	[illegible]	45.287	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	45.287	[illegible]	[illegible]	[illegible]	[illegible]	12.423
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.422	[illegible]	[illegible]	[illegible]
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683.05	0.999	13.834	14.604	-5.567	45.287	39.661	12.422	49092.90	42995.700	12.420
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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1093.05		13.834	[illegible]	[illegible]	[illegible]	[illegible]	12.421	[illegible]	[illegible]	[illegible]
		13.834	[illegible]	[illegible]	[illegible]	[illegible]	12.421	[illegible]	[illegible]	[illegible]
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		[illegible]	14.604	-5.568	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.421
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		3.834	[illegible]	[illegible]	45.287	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		13.834	14.604	-5.568	45.287	[illegible]	[illegible]	49681.60	[illegible]	[illegible]
		13.834	[illegible]	[illegible]	45.287	[illegible]	[illegible]	49726.90	[illegible]	12.420
		13.834	[illegible]	[illegible]	45.287	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.418
		[illegible]	14.604	[illegible]	45.287	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

8. Conclusion

By modifying our recently proposed light speed expanding Hubble-Hawking universe, in this paper we are presenting a very simple model of light speed rotating universe with a possible halt. It is absolutely against to the current notion of accelerating universe and dark energy. In this context, we would like to appeal that, based on the rate of decrease in current and future cosmic temperature, our proposal can be verified. Proceeding further, so far, no single cosmological observation has shed light the direct existence of dark energy and no single observation has reported a direct measure of galactic receding speed and direct measure of galactic accelerating speed. Point to be noted is that, whether galaxy is receding or revolving about a center also is not clear. It's a general and commonly followed belief that galactic distance is a measure of galactic receding speed. It may be noted that, based on proposed red shift definition, Hubble's law can be considered as a representation of ending stage of cosmic expansion having light speed rotation.

We agree that, in this paper, we are not providing sufficient cosmological explanation for the reasons of current cosmic halt, but it may be noted that factors like initial high cosmic expansion speed, decelerating mode of cosmic expansion with increasing mass and decreasing temperature, current sub zero cosmic temperature of 2.7 K, very small value of the current Hubble parameter and observed very minor fluctuations in current cosmic temperature can be considered as favorable conditions for further analysis. Considering our proposed energy based definition of red shift, it seems compulsory to review the basics of Lambda cosmology. If one is willing to consider red shift as a measure of galactic distance, one can get a chance to study the observable universe in a new dimension accompanied by light speed rotation. As explained in section (5), equations (8) to (12) are having very strange origin and need a careful review at fundamental level. If it is an accidental coincidence, as the equations are strongly coupled with gravitational and cosmic physical constants, then one must think about the scope, applicability and validity of those equations in a different manner with reference to Dirac model of large numbers or quantum gravity or final unification. We are sure to say that, theory point of view, these equations are having good scientific background compared to dark energy like ambiguous entities. With a joint research associated with microscopic physics and cosmic physics, true nature of cosmic expansion can be understood. As there exists no strong experimental

evidence for the currently believed dark matter, until its detection, dark matter can be considered as a representation of super gravity of galactic baryon mass associated with its cut-off mass limit at (180 to 200) million solar masses.

Qualitatively and quantitatively, in a theoretical approach, compared to the historical arguments on cosmic rotation, our views seem to be more coherent, strongly connected with quantum gravity and are closer to observational findings. Hence, we sincerely appeal the science community to recommend our light speed rotating model of the Hubble-Hawking universe for further research.

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Appendix A: C++ program for estimating various galactic distances

```
#include <conio.h>

#include <iostream.h>

#define c 299792.458

 int main(){

float z=0.05;

 do{

  z = z +1;

 float H0 = 66.893;

// Hubble constant (km/s/Mpc) - adjust according to taste

 float  OM = 0.32;  // Omega(matter) - adjust according to taste

 float OL = 0.68;    // Omega(lambda) - adjust according to taste

 float OR = 0.42/(H0*H0);

// Omega(radiation) - this is the usual textbook value

 long i;

 long n=10000;        // Number of steps in the integral

 float OK = 1-OM-OR-OL;      // Omega(k) defined as 1-OM-OR-OL

 float HD = 3.2616*c/H0/1000;  // Hubble distance (billions of light years).
See section 2 of Hogg
```

```
float a, adot;          // Redshift "z", Scale Factor "a", and its derivative "adot"

float DC, DCC=0, DT, DTT=0, DA, DL, DM;

float age, size;          // The age and size of the universe

for(i=n; i>=1; i--) {      // This loop is the numerical integration

  a = (i-0.5)/n;          // Steadily decrease the scale factor

  // Comoving formula

  (See section 4 of Hogg, but I've added a radiation term too):

  adot = a*sqrt(OM*pow(1/a,3)+OK*pow(1/a,2)+OL+OR*pow(1/a,4));

 // Note that "a" is equivalent to 1/(1+z)

  DCC = DCC + 1/(a*adot)/n;   // Running total of the comoving distance

  DTT = DTT + 1/adot/n;

  // Running total of the light travel time (see section 10 of Hogg)

  if (a>=1/(1+z)) {       // Collect DC and DT until the correct scale is reached

    DC = DCC;          // Comoving distance DC

    DT = DTT;         // Light travel time DT

  }

}

 // Transverse comoving distance DM from section 5 of Hogg:

if (OK>0.0001) DM=(1/sqrt(OK))*sinh(sqrt(OK)*DC);
```

```
else if (OK<-0.0001) DM=(1/sqrt(fabs(OK)))*sin(sqrt(fabs(OK))*DC);

else DM=DC;

age = HD*DTT;            // Age of the universe (billions of years)

size = HD*DCC;           // Comoving radius of the observable universe

DC = HD*DC;              // Comoving distance

A = HD*DM/(1+z);         // Angular diameter distance (section 6 of Hogg)

DL = HD*DM*(1+z);        // Luminosity distance (section 7 of Hogg)

DT = HD*DT;              // Light travel distance

 float dt,zn,cd,ld;

zn=(z/(z+1));            // Modified red shift

dt=zn*HD;                // Estimated light travel distance

cd=exp(zn)*dt;           // Estimated comoving distance

ld=cd/(1-zn);            //Estimated luminosity distance

cout<<z<<","<<zn<<","<<DT<<","<<dt<<","

     <<((DT-dt)/DT)*100<<","<<DC<<","<<cd<<","

     <<((DC-cd)/DC)*100<<","<<DL<<","<<ld<<","<<((DL-
ld)/DL)*100<<endl;

} while (z<=1100.0);

}
```

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